LABOUR MARKET WAGE POLICY AND RURAL HOUSEHOLD WELFARE IN NIGERIA

By

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ABSTRACT

Labour market participation, alongside unregulated rural sector wage policy could diminish the welfare of household heads and their members in rural areas of Nigeria. Evidence is scanty on the effect of labour market wage policy on welfare of households. Therefore, effects of labour market wage policy on welfare of household heads and their members in rural Nigeria were investigated.

Secondary data from the General Household Survey (GHS 2010/11, wave 2) with a total of 1,319 household heads were used. A Social Accounting Matrix (SAM) constructed from the input-output table for Nigeria for year 2011, the GHS 2010/11 survey data and the National Bureau of Statistics sectoral output data for 2010 were used. The SAM sectors were crop production, other agriculture, crude oil and mining, manufacturing together with utilities and services. The data comprised socioeconomic characteristics (age, income, education, marital status, household size and farm size), labour market activities, Labour Market Participation (LMP), sectoral output (for crop production and other agriculture), skilled and unskilled labour employment. A static Computable General Equilibrium (CGE) model of the Nigerian economy was developed using 12%, 30% and 67% simulated wage increases based on past and proposed wage increases in Nigeria. Data were analysed using descriptive statistics, Gini index, fuzzy sets, ordered probit regression at $\alpha_{0.05}$ and CGE simulation.

Age of household heads was 50.0±15.5 years, household size was 6.3±3.3 and 2.4% had no formal education. Household heads earned less than the current national minimum wage at ₦17,060.16±28,950.10 monthly. Agriculture was the primary labour market activity of 57.6% and 58.0% of male and female household heads, respectively. The LMP was 34.0% among the household heads. Wage inequality (Gini index, 0.38) and welfare (fuzzy sets welfare index, 0.12) were low. The LMP by a household head (β=0.16), being single (β=0.05) and having large farm holdings (β=0.02) reduced the probability of having high household welfare. The 2011 SAM showed that crop production constituted 24.0% of domestic output and accounted for 19.5% and 31.2% of skilled and unskilled labour employment, respectively. Other agriculture sector constituted 3.0% of domestic output, as well as 1.5% and 2.4% of skilled and unskilled labour employment, respectively. Skilled labour income from urban formal, urban informal, rural

formal and rural informal sectors were 73.1%, 6.9%, 3.9% and 16.1%, respectively. The simulations revealed that with 12% and 30% increases in the minimum wage, the domestic output declined in four sectors by an average of 4.9%, while it increased in the crude oil and mining sector by an average of 0.4%. However, with a 67% increase, domestic output declined in all sectors by an average of 10.1%. All wage increases led to decline in labour employment in rural areas due to higher wages. Most macroeconomic aggregates fell, including GDP by 2.6% and real GDP by 8.5%. The minimum wage policy reduced rural and urban household welfare by 1.3% and 0.9%, respectively.

The minimum wage policy did not improve the welfare of rural household heads and their members in Nigeria.

Keywords: Rural labour market participation**,** Minimum wage policy, Rural household welfare, Computable General Equilibrium

Word count: 492

DEDICATION

I dedicate this work to my FATHER, my GOD and FRIEND Jehovah!

"Although the fig tree may not blossom, and there may be no fruit on the vines; although the olive crop may fail, and the fields may produce no food; although the flock may disappear from the pen, and there may be no cattle in the stalls; yet, as for me, I [have always exulted] in [YOU]; I [have always been] joyful in the God of my salvation. The Sovereign Lord JEHOVAH is my strength; He [has made] my feet like those of a deer and [caused] me to tread on high places."

– **Habakkuk 3:17–19**

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What could I have done without the support of my wonderful family? Daddy, Mummy, Sister Ruth, Okwy, Eby, Ify, Busayo, Uncle Woeli, Jessy, Darrel, Aunty Franca; your love, emotional, financial and spiritual supports are priceless. May Jehovah uphold you all and grant all your hearts' desires. You will always hold a special place in my heart. Mummy, though you rest waiting for Jehovah to "call", I still feel your love and care. I'm motivated everyday by your spirituality, determination, drive and positivity. You are everything I could ever have wanted in a mother and so much more. I wait patiently for you to complete your "compulsory service" and return to me. Love you Mummy!

Finally, I wish to say "thank you" to all my friends and well-wishers, especially all members of Barth Road, Amina Way and New Adeoyo Congregations of Jehovah's Witnesses. JAH BE WITH YOU ALL.

Chuks Onyeka, IDIAYE (B. Agric., M.Sc.)

CERTIFICATION

I certify that this work was carried out by Mr. **Chuks Onyeka IDIAYE** in the Department of Agricultural Economics, University of Ibadan.

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CBN	**–**	Central Bank of Nigeria
CES	**–**	Constant Elasticity of Substitution
CET	**–**	Constant Elasticity of Transformation
CGE	**–**	Computable General Equilibrium
COM	**–**	Crude Oil and Mining
CPI	**–**	Consumer Price Index
CRP	**–**	Crop Production
EU	**–**	European Union
FGN	**–**	Federal Government of Nigeria
FGT	**–**	Foster, Greer and Thorbecke
FRC	**–**	Formal Rural Core Poor
FRM	**–**	Formal Rural Moderately Poor
FRN	**–**	Formal Rural Non-Poor
FUC	**–**	Formal Urban Core Poor
FUM	**–**	Formal Urban Moderately Poor
FUN	**–**	Formal Urban Non-Poor
GDP	**–**	Gross Domestic Product
GHS	**–**	General Household Survey
GPZ	**–**	Geopolitical Zone
IFPRI	**–**	International Food Policy Research Institute
ILO	**–**	International Labour Organization
IMF	**–**	International Monetary Fund
IMR	**–**	Inverse Mills Ratio
IO	**–**	Input-Output Table
IRC	**–**	Informal Rural Core Poor
IRM	**–**	Informal Rural Moderately Poor
IRN	**–**	Informal Rural Non-Poor
IUC	**–**	Informal Urban Core Poor
IUM	**–**	Informal Urban Moderately Poor

IUN	**–**	Informal Urban Non-Poor
LMP	**–**	Labour Market Participation
MAN	**–**	Manufacturing
MC	**–**	Marginal Cost
MFC	**–**	Marginal Factor Cost
MR	**–**	Marginal Revenue
MVP	**–**	Marginal Value Product
MWI	**–**	Mean Welfare Index
NBS	**–**	National Bureau of Statistics
NISER	**–**	Nigerian Institute of Social and Economic Research
NPC	**–**	National Population Census
OAG	**–**	Other Agriculture
OECD	**–**	Organization for Economic Cooperation and Development
OLS	**–**	Ordinary Least Square
RGDP	**–**	Real Gross Domestic Product
ROW	**–**	Rest of the World
SAM	**–**	Social Accounting Matrix
SSA	**–**	Sub-Saharan Africa
SSHE	**–**	Sectoral Shares of Household Expenditure
SSTFI	**–**	Sectoral Shares of Total Factor Income
US	**–**	United States
UTS	**–**	Utilities and Services
VMP	**–**	Value of Marginal Product
WHO	**–**	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The development of any economy requires efficient allocation of resources in order to achieve sustained economic growth. Thus, the labour endowment of a society, which is its most important natural resource (Adegeye and Dittoh, 1985), is crucial to the processes of production, capital accumulation, saving and ultimately economic growth. Developing economies, however, are often plagued by weak economic structures that cannot accommodate the large population of their potential workforce due to paucity of capital to productively engage them, which is often the bane of those economies (Campbell and Ahmed, 2012). The situation of high population growth coupled with slow economic growth often results in labour supply pressures and massive underemployment. To illustrate, with around 5% of world output, Africa and the Middle East held the smallest share between 2000 and 2009; in spite of this, both continents experienced the highest population growth figures of about 2.5% per annum during the same period (ILO, 2010). This has created a situation of excess labour supply seeking employment, rather than the growth-induced labour demand experienced in the developed and emerging economies of the world. Thus, incomes are often inadequate and household welfare diminished (Campbell and Ahmed, 2012).

Dual economy theorists (such as Dixit, 1973; Kuznets, 1955 and Lewis, 1954) generally hold the opinion that labour markets in developing countries are characterized by fragmentation and that the rural/primary/agricultural sector holds a far smaller proportion of the labour force of many countries than the urban/industrial sector. Also, wages are believed to be much smaller in the rural sector. In most emerging economies of Europe, for example, the rural sector accounts for less than 10% of the labour force, and in a third of these rural regions its share is less than 5%. Rural employment of as high as 25% can only be observed in peripheral regions of Central and Eastern European Countries (such as Romania, Bulgaria and Latvia) largely due to the scarcity of alternative employment as well as a slow rate of structural adjustment in such economies (Copus *et al.*, 2006). Therefore, there is always the possibility of a massive drift of the labour

force to either urban or rural non-agricultural activities as a result of economic growth and expansion of opportunities in non-agricultural sectors of those economies.

In the largely agrarian societies of Africa, Asia and the Middle East, however, the situation is different. With agriculture as the main income earning activity for majority of the population, the rural areas, which hold large amounts of agricultural land, have more of the labour force than the slowly emerging urban industrial areas. In Africa as a whole, about 64% of the labour force is engaged in the rural areas; in sub-Saharan Africa, it is slightly higher at 69%; whereas in Asia it is 60% (ILO Statistics, 2011). These stand in contrast to the global situation in which the rural labour force is less (44%) than the urban (56%) labour force. Similarly, rural labour employment in America (30%) and Oceania (36%) are less than that of the urban (ILO Statistics, 2011).

The rural sector, along with its labour force, is often faced with income uncertainty. The rural economy often cannot adequately support livelihoods, especially for subsistence farmers (owners of farms and suppliers of labour) as they are usually susceptible to low productivity, low incomes and vulnerable livelihoods (Buchenrieder *et al.,* 2007). Further exacerbating the problem in sub-Saharan Africa (SSA), agricultural production and other rural economic activities are being threatened by huge rural-urban drifts. Therefore, there has been a steady decline in the supply of both skilled and unskilled labour to the rural sector. Hence, labour has become a major limiting factor in agriculture (especially crop production) and other economic activities (Adeyemo *et al.,* 2010; Ogunsanmi and Saka, 2001). Notwithstanding the seasonal labour migration between different agro-ecological zones that provides some respite to labour shortage (Swindell, 1985), this trend is expected to continue in SSA as shown in figure 1 (see appendix).

Over 65% of the Nigeria's work force is employed in the rural areas (NBS, 2005). Agriculture is the mainstay of rural Nigeria and the bulk of its production is done by small scale and/or subsistence farming households. Thus, the majority of those employed in agriculture belong to the low-income class resulting in widespread income and food poverty in the rural areas (Ogunwale, 2005; FGN/WHO, 2004). The major function of a labour market is to allocate wages. Hence the welfare of the major actors in the economy is determined by the effectiveness of the labour market. The aforementioned, along with the fact that most of the poor live in the

rural areas, means that the effectiveness of the rural/informal labour market is very important for the achievement of pro-poor growth as the rural poor often have their labour endowment as their major assets which they can exchange for wages only via the labour markets (Leavy and White, 2003). Given that labour productivity can be seriously impeded by socio-economic issues outside the control of the household, wage determination and allocation purely by market forces without necessary mediation through well-tailored policy is a major cause of income inequality (Mankiw, 2012). This impacts severely on rural areas.

1.1.1 **Overview of Labour Policy in Nigeria**

In Nigeria, government labour market policy has contributed little to mitigating income and welfare uncertainties faced by rural households. The domestic labour market policies in the country have centered largely on wage determination in relation to the welfare of workers, and have applied almost exclusively to urban formal sector employment. In this regard, modern sector wages and salaries in Nigeria have always been determined and regulated by administrative actions of government, wage commissions, price and income policies whereas those of the rural, informal and intermediate sectors are influenced to a large extent by the demand and supply of labour and, to a minimal extent, by wage levels in government establishments (Fapohunda, 1979). More often than not, changes in the cost of living indices rather than productivity changes have been the considerations for wage determination by the government in the urban sector (Aminu, 2011). This provides some form of protection from income uncertainty for formal sector workers. However, the rural/informal sector remains largely unregulated.

With respect to urban sector wage regulation, between 1972 and 2000, the minimum wage in Nigeria was reviewed six (6) times resulting in an over 9000% increase (see Table 1 in appendix). Between 2004 and 2006, there were further reviews including the Wages, Salaries and Emolument Relativity Panel (2004/2005) and the Consolidation of Public Sector Emolument Panel (2005/2006). However, none of these acts/commissions had informal sector wage regulation as part of their terms of reference. Thus, there have not been any meaningful positive impacts of wage policy efforts in Nigeria on the welfare of rural households due to the

prevalence of informal sector activities in the rural economy over formal sector activities which government seeks to regulate.

1.2 **Problem Statement**

Informal labour wages are largely unregulated through domestic policy in Nigeria, resulting in significant seasonal fluctuations in incomes due to market forces of labour supply and demand. Further, informal sector workers exhibit a constant marginal productivity of labour which means that they receive just a share of a rather constant wage pool for their activities which implies that those wages are often too small to reflect the realities of their economic environment, thus resulting in widespread poverty in the sector (Fields, 2004). Worse still, urban sector wage policies have also affected informal/rural sector wages negatively through two mechanisms. First is the minimum wage policy in Nigeria which, historically, has led to inflationary trends that reduce real wages throughout the economy. Consequently, falling real incomes for households (owners of farms as well as suppliers of labour) have engendered poverty in the rural sector (Lemos, 2004; Fapohunda, 1979). The second is the minimum wage and related policies in Nigeria which have greatly limited employment in the urban/formal sectors and forced more workers into informal/rural sector activities, leading to excess labour supply in the informal sector that results in the reduction of wages (Fields, 2004). From the aforementioned, it is obvious that proper policy focus is lacking in Nigeria with regards to the rural/informal sector as the sector is hardly factored into the policy-making process. The impact of this is minimal consideration for the rural sector in wage policy formulation.

The Nigerian labour market is composed of many sources of income, including direct compensation in the form of cash and non-cash income (Ogwumike *et al.,* 2006). However, direct payment via the labour market is the chief contributor to income security (Liebrandt *et al.,* 2001). Rural labour suppliers in Nigeria are usually exposed to income insecurity due to the seasonality of labour demand in agriculture and the unwillingness of employers of agricultural workers to give long-term contracts, preferring to put off demand to peak production seasons (Leavy and White, 2003). Therefore, many farm workers continue to supply their labour even when their marginal value product is significantly less than the ruling wage rate, exposing them to poverty and wage inequality.

Against this backdrop, it becomes pertinent to investigate how government's minimum wage policy affects the welfare of the rural household in Nigeria. To adequately address this issue, this research has sought to provide answers to the following questions:

i. How do rural households participate in the rural labour market?
ii. Does the labour market participation decision of rural household heads affect household welfare?
iii. Is the rural economy affected by the minimum wage policy?
iv. How do changes in labour market policy affect rural households' welfare?

1.3 Objectives of the Study

The broad objective of the study is to examine how labour market wage policy in Nigeria affects the welfare of rural households. The specific objectives are to:

i. Profile the rural labour market in terms of arrangements, participation and wages.
ii. Examine the effect of labour market participation on rural household welfare.
iii. Determine the effects of the changes in domestic labour market wage policy on the rural economy.
iv. Examine the effects of changes in domestic labour market wage policy on rural household welfare (See Table 4 in chapter three for the analysis of these objectives).

1.4 Justification of the Study

Government policy has been identified in literature as an important factor in mitigating poverty (Nwafor *et al.,* 2007; Bos, 2003). The benefits of any macroeconomic policy efforts of the government aimed at improving welfare can be transmitted to rural households via the labour market. Thus, the effectiveness and efficiency of the labour market is of crucial importance to improving rural welfare. However, with low agricultural funding in Nigeria, many rural households seek to mitigate poor incomes by seeking off-farm employment (Agwu *et al.,* 2012; Babatunde and Qaim, 2009).

Off-farm labour supply tends to result in a poverty trap for poor rural households since their own-farm productivities are significantly lowered due to their supply of more and more of their labour to low-paying off-farm activities to the neglect of their farms (Sitienei *et al.,* 2013). The

expectation is that more efficient and effective rural labour markets will ensure higher incomes for the farm families as well as the farm labourers through expanded and more lucrative income opportunities on and off the farm. The resulting higher and more diversified rural incomes will thus help reduce poverty and boost welfare. This study therefore attempted to investigate what effect participation in the labour market has on rural households' welfare in Nigeria.

While certain studies on labour market participation (Bedemo *et al*., 2013; Adepoju and Obayelu, 2013; Babatunde and Qaim, 2011; Ibekwe *et al*., 2010), have relied on multinomial logistic, probit or ordinary least square (OLS) regression techniques to examine welfare effects, this study applied the Heckman double hurdle model. The model has the advantage of identifying the existence, or otherwise, of any selection bias since labour market participation (LMP) has exogenous covariates which affect it and might also be correlated with the welfare status of households. The ordered probit model was also applied to examine the effect of the major covariate (LMP) on household welfare, which was operationalized as three ordered categories of non-poor, moderately poor and core poor households.

This study also provided empirical evidence for the effects of labour market policy on the rural economy as well as household welfare in Nigeria. The general labour market equilibrium approach is the only framework that allows the capturing of adjustments on the demand and supply sides of the labour market in a consistent way, allowing for the capturing of three key adjustment margins which are (i) intersectoral labour migration and labour market participation decisions of the workforce, modelling rural labour supply adjustments; (ii) the production decisions of farmers, capturing labour demand response to changes in the macroeconomic environment and policy shocks; and (iii) the functioning of rural labour markets in terms of search costs for both employers and workers capturing rural labour market imperfections, the spatial and sectoral matching issues and transaction costs of rural labour markets (Buchenrieder *et al.,* 2007). Therefore, this study employed the general equilibrium approach in capturing the effects of domestic labour market (minimum wage) policy on the rural economy as well as the effects of adjustments in the rural labour market on rural household welfare in Nigeria.

Further, Computable General Equilibrium (CGE) literature hardly focuses on the labour market; and many of the classical CGE studies in the areas of trade liberalization, tax analysis and climate policy make the simplest possible set of assumptions about the labour market (that is, they assume fixed labour supply and that a uniform, flexible, market-clearing wage balances both labour supply and demand without due consideration to changes in labour force participation and/or composition, labour skills, wage dynamics and rigidities, unemployment, as well as barriers to intersectoral labour mobility) (Boeters and Savard, 2012). This study takes a different trajectory from previous CGE studies (such as Nkang *et al*. (2012); Diao *et al*. (1996); Tarr (1989)) by attempting to incorporate labour market imperfections (such as wage rigidity, labour skills differentials, barriers to labour mobility, rural-urban differentials among others) that are largely ignored in many studies using CGE modeling.

Also, studies which directly link macro-level labour market adjustments to rural welfare are rare in the literature and almost non-existent in Nigeria. Thus, this study contributes to scant literature that provides direct empirical links between the labour market and rural household welfare in Nigeria. Sassi (2011) used both the Todarian and dual economy model frameworks to simulate the effects of Kenya's migration policies on poverty in rural Kenya while De Brauw and Giles (2008) also carried out a similar study, looking at the effect of migrant labour markets on rural household welfare in China. Drawing on these two previous studies, this study which is also based on both the Todarian and dual economy models, modeled the effects of wage policy on rural welfare as against a migration policy which is nonexistent in Nigeria. This provided empirical evidence into how urban wage policies could indirectly affect income and welfare in the informal sector.

1.5 **Plan of the Report**

The rest of the study is organized as follows. Chapter two contains the literature review and conceptual framework. Chapter three describes the various analytical methods used in the study. Chapter four presents the results and discussion of the findings of the study while chapter five holds the summary of major findings, the conclusion and policy recommendations.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Framework

This underpinning of this study is two main economic theories: the neoclassical theory of distribution and the theory of labour. The neoclassical theory of distribution presents a general model of demand and supply of labour within an economy based on the marginal productivity of labour while the labour theory builds further on this, employing the concepts of a dual economy, labour migration and labour market crowding to explain intersectoral linkages in the labour market. Significantly, both models provide insight into wage formation and employment which are explained in some of the subsections presented in the course of this chapter.

2.1.1 The Neo-classical Theory of Distribution

The neoclassical theory of distribution posits that the earning of each factor of production is a function of the supply and demand for that factor. The demand, on the one hand, is determined by the marginal productivity of that factor of production. Considering a competitive firm (both in the factor and output markets) that has the profit maximizing objective, its labour wage along with output prices are determined by the forces of demand and supply. Therefore, at equilibrium, labour earns a wage equivalent to the value of its marginal contribution to the production process (Mankiw, 2012). Hence, such a farm hires labour up to the point where the value of its marginal product equals the ruling wage rate (i.e. the point of profit maximization). Therefore, the firm's short-run demand curve for labour is also its value of marginal product (VMP) curve which is negatively sloping due to diminishing marginal product of labour. A competitive firm faces a perfectly elastic supply of labour (S_L) which tallies with the wage rate and the marginal factor cost (MFC) of labour ($W = S_L = MFC_L$). Since optimal resource allocation or profit maximization requires that the marginal cost of labour (MFC_L) equals its value of marginal product (VMP), this farm would demand L units of labour as shown in Figure 2.

Given the peculiarity of Nigerian agriculture, however, during off-season periods, the marginal productivity of labour is significantly lowered, therefore, the VMP curve shifts to the left (VMP_1). Also, the lowered marginal productivity of labour during these periods is reflected in

significantly lower wages earned. Therefore, a new equilibrium is established at (VMP_1, W_1) characterized by dwindling labour demand (L_1) and depleted wages (W_1).

With respect to labour supply, its determination derives from the work–leisure trade-off. The greater the market wage rate, the higher the opportunity cost of leisure, thereby influencing more households to substitute more labour for time spent in leisure. Hence, a labour supply curve with a positive gradient is expected. Nevertheless, the substitution and income effects on labour supply cause the labour supply curve to slope backward as wages rise. The wage increase is composed of two separate effects: the pure income effect and a substitution effect. The income effect is shown as the shift from point A to point C in Figure 3.

Income (and thus consumption) increases from Y_A to Y_C while leisure time increases from X_A to X_C (employment time reduces by the same proportion; X_A to X_C). As the wage rate rises, it becomes more rational for the worker to spend more hours working rather than engaging in leisure as the higher wage rate means a surge in the opportunity cost of leisure. This substitution effect is represented by the transition from C to B. The net impact of both effects is captured by the shift from A to B. Sometimes, the substitution effect is greater than the income effect (whereby more time will be allocated to working), whereas in other instances the income effect is greater than the substitution effect (whereby less time is allocated to working). Which of the two situations obtains is determined by the relative magnitude of the marginal utilities derived by the worker from income and leisure respectively. Consequently, the shape of an individual's supply curve might be affected by individual characteristics as well as external factors like taxation, welfare, work environment and income as a signal of ability or social contribution.

Equilibrium is attained in the labour market where the demand for labour L^d equals the supply of labour (L^s). This occurs at the wage rate, w^* in Figure 4. At the lower wage, w_1, there is an excess demand for labour ($L_3 < L_1$) while at the higher wage, w_3, labour is supplied in excess ($L_1 < L_3$). The wage rate w^* is the equilibrium wage while the equilibrium labour supply is L^*. Hence, the total labour earnings in the economy at equilibrium is given by w^*L^*.

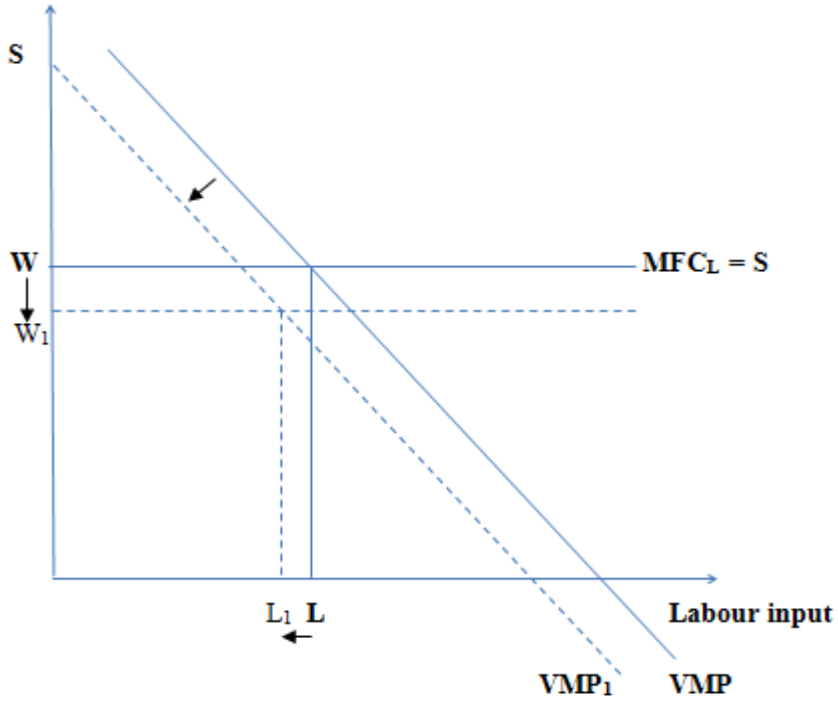


Figure 2: The Short-Run Labour Demand Curve

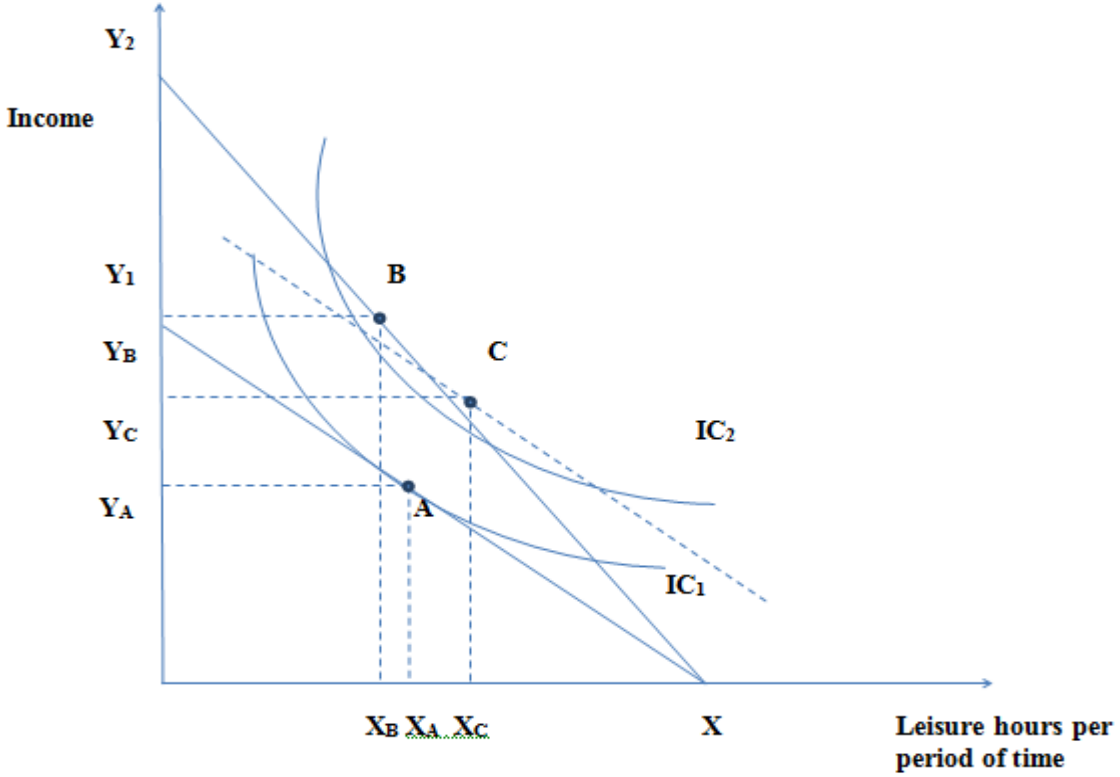


Figure 3: Income and Substitution Effects on Labour Supply

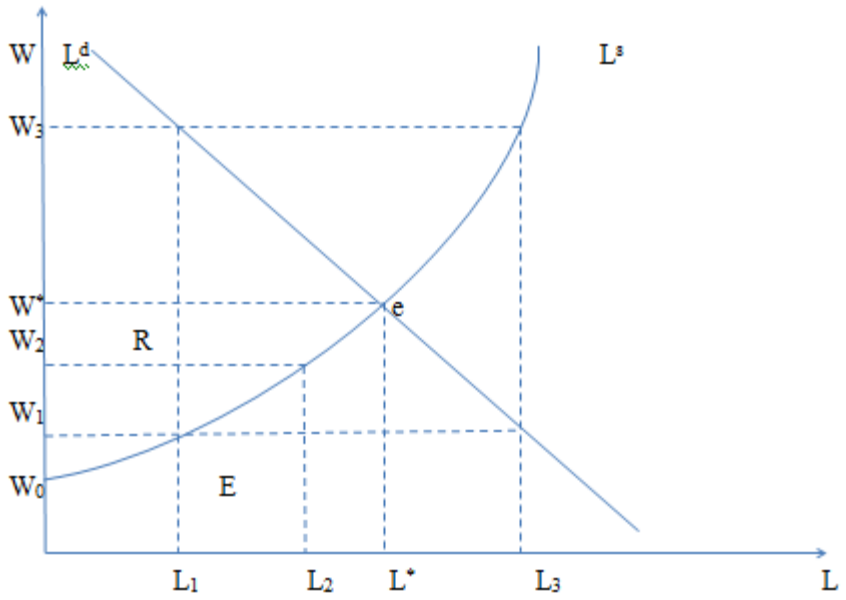


Figure 4: The Labour Market Equilibrium

Labour earnings can be divided into economic earnings (E) and rental earnings (R). Economic earnings are the portion of labour wages which is necessary and sufficient to employ the particular factor, that is, the opportunity cost (also the hiring cost) of labour. Rental earnings, on the other hand, refer to any payment received by labour above their economic earnings as a result of their being fixed in supply.

When the labour market is in equilibrium (w^*, L^*), every worker individually receives the equilibrium wage, w^*. Yet, at a lower wage than w^*, some workers would still have been attracted into the market; they nonetheless receive w^*. For instance, from Figure 4, at wage w_1, the amount of labour supplied is L_1. Thus, the economic earnings of the L_1 workers, that is, the wage that would have been sufficient to command their labour, is not more than w_1. However, in equilibrium, this same set of workers, L_1, are paid the equilibrium wage w^*, which is noticeably higher than w_1. This principle applies to all the labour supply below the equilibrium L^*. Thus, the area below the labour supply curve reflects rental earnings.

Shifts can occur in the relative positions of the labour supply and demand curves. For example, the greater the benefits of leisure, the less will be the labour supply no matter the wage rate (i.e.

L^s shifts left, Figure 4) and accordingly the greater the wage required to command any labour and thus the higher the economic earnings of any employed labour and the reverse is true, with higher rental earnings. The extreme situation can be used to illustrate this as seen in Figure 5. Assuming a vertical/perfectly inelastic labour supply (L^s), at any wage rate all of the labour force will be willing to work. Equilibrium remains positive at "e" (i.e. $w^* > 0$) and positive labour earnings are recorded (w^*L^*). All of these earnings are however, rental earnings while economic wages are nil. This is because inelastic labour supply (vertical L^s, no alternative employment) means that any wages earned by labour must be the result of a limited supply of workers whom the firms are striving to attract. That is, firms are forced to raise wages artificially above what would ordinarily be sufficient to command labour. The labour supply will remain L^* irrespective of what wage is advanced. Therefore, even though workers would be willing to work for almost zero wages, competition among firms forces their wages up in any case. Conversely, assuming labour supply is horizontal/perfectly elastic ($L^{s`}$), an infinite amount of labour is supplied when the wage is greater than $w^*$. Earnings, in this case will, however, be completely made up of economic earnings with zero rental earnings. When the labour supply is perfectly elastic ($L^{s`}$) the equilibrium wage, w^*, would be adequate to command any labour. At this wage, an infinite amount of labour is supplied. Labour supply is infinite at w^*. This means that, as long as firms pay at least w^*, there is an unlimited supply of workers and there will be no motivation for firms to pay workers above their minimal opportunity cost wage, w^*.

2.1.2 **The Labour Theory**

The labour theory as developed by Fields (2004) is adapted for this study. The theory is founded on 4 key building blocks namely: (i) the duality of the labour market (i.e. labour market segmentation), (ii) wage formation and employment in the formal (urban) economy, (iii) wage formation and employment in the informal (rural) economy and (iv) intersectoral linkages. Generally, it is assumed that firms and workers are profit and utility maximizing respectively. Each of this is briefly discussed hereby.

(i) **Labour Market Duality:**

The principle of duality suggests that workers in developing economies do not all supply their labour in a single labour market. Although real life developing economy labour markets are

typically fragmented into more than two segments, for analytical convenience, a two sector (formal and informal) labour market structure is assumed. This is crucial in order to model important social and economic distinctions between both sectors. Wages earned by workers are determined by the sectors in which they work and are typically higher in the formal/urban sector (wage dualism). Workers, therefore, search the labour market for the best opportunities. Earnings in one sector can, however, influence earnings in the other sector while mobility of labour between sectors is restricted largely on the basis of differentials in human capital endowments of suppliers of labour.

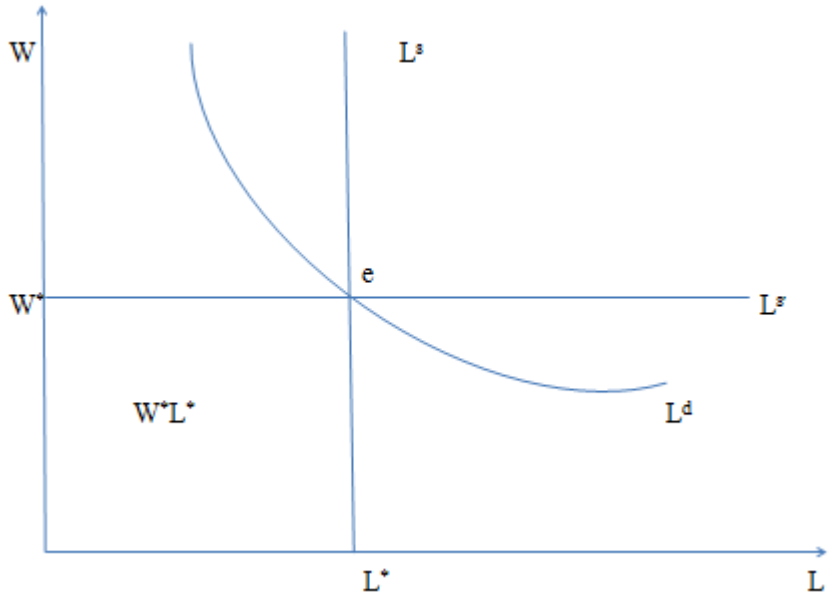


Figure 5: Pure Rental and Pure Economic Labour Earnings

(ii) **Wage Formation and Employment in the Formal (Urban) Economy**:

The classic labour market equilibrium is assumed to define how wages and employment are set within the formal economy as explained in section 2.1.1 (Figure 4), that is, the amount of labour demanded is considered to be a decreasing function of the wage. The market labour demand curve is negatively sloping as a result of diminishing MVP of labour and the associated income and substitution effects of a wage change. Hence, the amount of labour supplied is seen as an increasing function of the wage. Conversely, the market labour supply curve is positively sloping because a higher wage attracts labour from other markets into this labour market and also prompts non-workers into the labour force. Accordingly, a market clearing wage is set based on

the labour supply and demand. Equilibrium is thus determined by the behaviour of firms, workers, and wages (which adjust to balance labour supply and demand). However, these assumptions do not always apply as the following explanation indicates.

- ***Above-Equilibrium Wage Rates – Minimum Wage Laws, Labour Unions and Efficiency Wages*:**

The labour market does not always operate as a free market. Minimum-wage laws, for example, force wages above the level in an unregulated labour market. Similarly, the market power of labour unions could also raise wages above the level that would hold without them. Mankiw (2012) suggests that union workers earn about 10 to 20 % more than similar nonunion workers in the United States. In addition, the World Bank (1995) reported as high as 31% and 24% rise in workers' wages in Ghana and South Africa respectively as a result of Union activities. Furthermore, the efficiency wage theory, which reckons that a firm might find it profitable to pay high wages due to its positive effect on the productivity of its workers, can also alter labour market equilibrium. A firm will pay efficiency wages as long as the productivity gains outweigh the increased cost since the main objective remains profit maximization. Also, a firm might use efficiency wages to attract the best and most productive workers from the pool available. The "above-equilibrium-wage" scenario is presented in Figure 6.

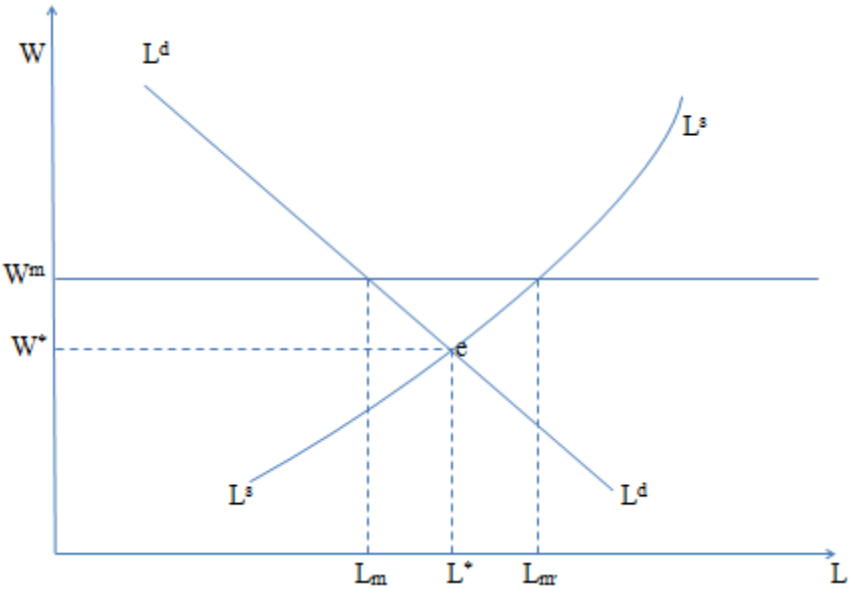


Figure 6: Effect of Above-Equilibrium-Wage Laws on the Labour Market Equilibrium

Figure 6, shows that a wage (w^m) imposed on the labour market, which is above the equilibrium wage (w^*), causes an excess labour supply ($L_{m'}$) above the equilibrium level while labour demand (L_m) drops below the equilibrium position. Thus, a labour supply surplus ($L_{m'} - L_m$) is created. Therefore, due to such an imposition of a wage higher than the market equilibrium, a crowding effect can be created in the informal labour market which lacks the benefit of formal unions or regulations to keep wages high, resulting in lowered informal sector wages as shown in Figures 7 and 8. Figure 7 shows the effect of crowding out workers from the formal sector (sector A in Figure 7) (leading to lower employment and higher wages) while Figure 8 shows the consequence of crowding workers into the informal sector (sector B in Figure 8) (leading to higher employment and lower wages). Informal sector wages could be lowered due to the greater ease of mobility of the excess labour ($S_A - S_A`$) created in the formal to the less specialized informal sector, thereby reducing labour earnings owing to the induced excess supply in the non-formal sector. In this manner, rural, agricultural and other informal sector workers could thus bear the consequence of a minimum wage policy in the formal/urban labour market.

- ***Supply-Side Behavior:***

Where wages are set during the peak season of production to a level above the market-clearing wage, during the slack season workers may decide to hold their labour supply (i.e. remain unemployed) for a while knowing that they could earn a higher wage in the long run when the peak season resumes (especially where hiring is done casually and labour demand is inelastic). Thus, even when the zero wage they would earn during the waiting period is factored in, the average wages earned during the longer period would still be higher than what they would have earned had they accepted the reduced wage. Similarly, this also results in the situation highlighted in Figure 6 where wages are kept high and unemployment persists.

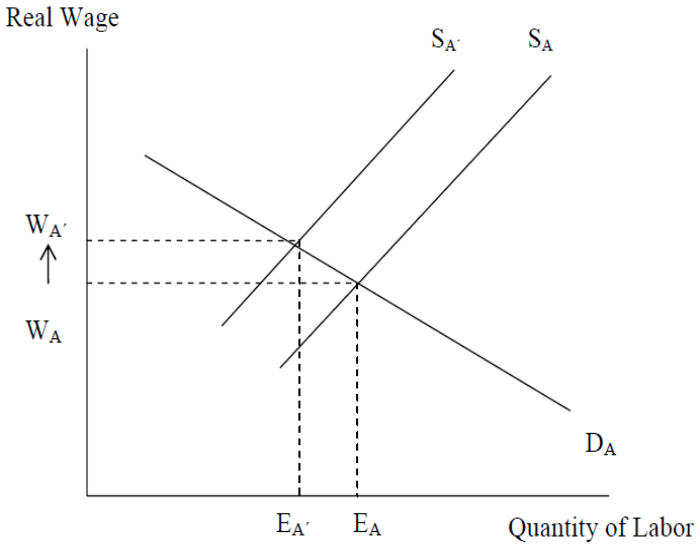


Figure 7: Labour Market Consequence of Crowding Workers Out of Sector A

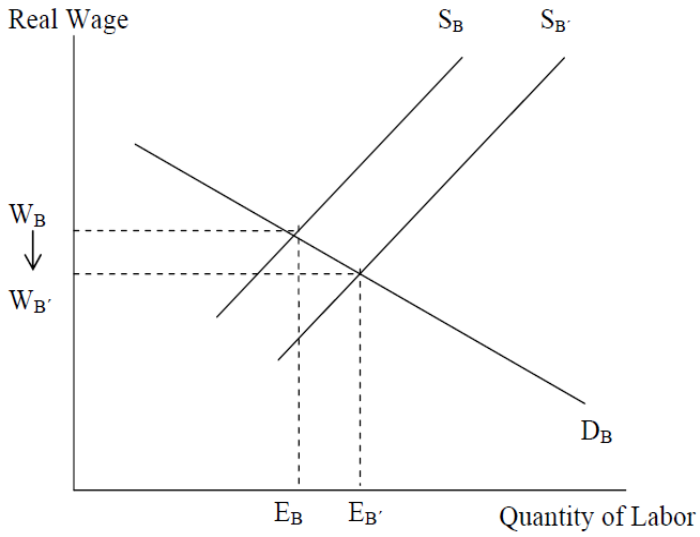


Figure 8: Labour Market Consequence of Crowding Workers into Sector B

(iii) **Wage Formation and Employment in the Informal (Rural) Economy**:

The informal economy is usually regarded as a free entry sector of last resort where wages are notably lower than those in the formal sector. Often, it caters for the low income earning labourers in developing economies. Marginal productivity in the informal sector is either very low or insignificant and is normally below the bargaining wage or income share received by labour. Therefore, wages are not determined by the marginal productivity of labour but by a share of income accruing to each worker. To this end, labour income can be determined in any one of the following ways:

(a) The assumption of a fixed amount of income to be earned in the informal sector by all the workers in that sector; meaning that the marginal output of labour is actually zero. It is therefore believed that there is full income-sharing among informal sector workers such that each earns the average product which is inversely proportional to the number of people in the sector.

(b) The assumption that a part of the informal sector experiences constant marginal product. Agricultural labour, for example, is assumed to earn the marginal product from their efforts, not an average product. Hence, assuming that an additional unit of labour and the marginal land are as productive as preceding ones the marginal product of labour in agriculture remains constant.

(iv) **Intersectoral Linkages – the Harris-Todaro Model:**

Fields (2004) developed a model of intersectoral linkages in an economy based on the Harris-Todaro (1970) model. It captures the reality of the duality of labour markets in a developing country like Nigeria where formal sector wages are significantly higher than those in the informal sector. Also, urban dwelling is a prerequisite for finding a job in the urban sector, resulting in the concept of labour migration. It also makes the assumption that labour supply exceeds demand in the formal labour market – thereby allowing for unemployment of parts of the labour force. Formal sector employers engage labour up to the point where their marginal output equals the wage, W_F. Conversely, the informal sector is assumed to be a free-entry sector where all individuals wishing to work in the sector may do so. Each worker employed in the informal sector earns a wage W_I (where, $W_I < W_F$).

Workers are modeled as earning mathematical expected wages from either of two search strategies: (a) searching for formal sector employment, which pays a relatively high wage but with the probability of unemployment, and (b) taking up an informal sector job, with low compensation but no risk of unemployment. Therefore, labour would be distributed between formal sector and informal sector search approaches such that the expected wages from the two search strategies are equalized as follows:

$$E(W_F) = E(W_I) \qquad (1)$$

In the basic Harris-Todaro (H-T) model, this equilibrium condition becomes:

$$W_F \frac{E_F}{L_F} = W_I \qquad (2)$$

Where E_F is employment in the formal sector and L_F is the labour force in the formal sector. Because $W_F > W_I$, it follows that $\frac{E_F}{L_F} < 1$, i.e., the formal sector labour force exceeds formal sector employment, and therefore a H-T equilibrium is characterized by open unemployment. Two important policy implications can be drawn from the model: (a) the solution to urban unemployment is not urban employment creation. This is revealed as follows:

A policy of increasing formal sector employment by $\Delta E_F = E_F' - E_F$ increases the formal sector labour force by: $\Delta E_F \frac{W_F}{W_I}$ and consequently, increases open unemployment by: $\Delta E_F (\frac{W_F}{W_I} - 1)$; and (b) the solution to urban unemployment is rural development. This is revealed as follows: Suppose that such a programme could increase the (rural) informal sector wage from W_I to W_I'. From the H-T equilibrium condition, unemployment would then fall from $E_F (\frac{W_F}{W_I} - 1)$ to $E_F (\frac{W_F}{W_I'} - 1)$. It is thus shown in the H-T model that equilibrating labour supply and demand and achieving optimum employment in an economy requires that rural development be made a priority as the possibility of migration between sectors means that creating employment in the urban sector in isolation will only result in greater urban unemployment.

2.2 **Methodological Review**

This section presents a review of the methods used in literature to analyze the key concepts in this study. Section 2.2.1 discusses welfare measurement in empirical analysis while section 2.2.2 contains a review of multinomial and ordered response models. Section 2.2.3 concludes with a review of methods used in economic equilibrium analysis.

2.2.1 **Welfare Measurement in Empirical Analysis**

Welfare measurement in empirical literature has long centered on household expenditure. This measure of welfare was pioneered by the Foster, Greer and Thorbecke (FGT) (1984) class of poverty measures. The FGT is a group of poverty indices, computed using a single formula, that can accommodate any degree of concern about poverty through the "poverty aversion" parameter, α (the P-alpha measure of poverty or the poverty gap index). It is given as follows:

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^\alpha \qquad (3)$$

Where z is the poverty line (usually derived as two-thirds of the mean per capita outlay), q is the number of households or individuals below the poverty line, N represents the total sample size, y_i is the income of the *ith* household, and α is the FGT parameter, which can assume the values 0, 1 and 2, based on the degree of concern about poverty.

Another of the traditional approaches to welfare/poverty measurement involves the adoption of an *absolute expenditure poverty line* below which households are considered to be poor. The poverty line is an internationally accepted monetary threshold below which an individual is regarded to be living in poverty. It is calculated by taking the monetary threshold from each country (which is a function of the bundle of goods needed to sustain one adult) and converting it to US dollars, while taking the purchasing power parity of the country into consideration. Currently, the generally accepted international poverty line is 1.25 US dollar per capita per day. This approach has a number of serious demerits. For example, using this line to determine how well off a population is can be deceptive as the line can be sufficiently low that a small amount of additional income will not indicate any significant difference in the quality of life of an individual. Furthermore, the method does not leave room to quantify other indicators of poverty,

such as education, health and social capital, thereby masking the total economic impact on the population.

Generally, the major drawback of the traditional approaches to poverty measurement is that they assess the poverty status of an individual by resorting to a single indicator of resources, such as income or expenditure; therefore, the poor are generally regarded as those individuals or households whose income or expenditure fall below a calculated poverty line. However, each indicator reflects only a specific aspect of poverty.

The multidimensional approach, however, not only takes account of the material situation of individuals but also captures their general living conditions. Besides, it encapsulates the gradual transition from a state of complete deprivation to a state of comfort. Therefore, welfare research often focuses on a multidimensional approach which employs more determinants than just income. The method of fuzzy sets originally developed by Zadeh (1965) is one of such measures. Here, the welfare of households is measured using indices of multidimensional poverty computed with the Fuzzy Set theory. Zadeh (1965) describes a fuzzy set as a class with a continuum of grades of membership. This means that in a population A of n households [$A = a_1$, a_2, $a_3 \ldots a_n$], the subset of poor households' B includes any household $a_i \in B$. These households present some degree of poverty in some of the (m) poverty attributes of the vector X. The degree of being poor by the i-th household (i=1,….,n) with respect to a particular attribute (j) (given that j = 1,…,m) is defined as: $\mu B[X_j (a_i)] = X_{ij}$, $0 \leq X_{ij} \leq 1$. Specifically, $X_{ij} = 1$ when the household does not possess welfare enhancing attribute and $X_{ij} = 0$ when the household possesses it. In the work of Betti and Verma (2002), they note that putting together definite indicators of deprivation for individual items in order to construct composite indices requires that one assigns numerical values to the ordered categories and the weighting and scaling of the measures.

A major merit of the multidimensional approach to welfare (or poverty) measurement is the fact that it allows for an objective assessment of all possible sources of deprivation for households. Furthermore, an analysis based on measures which consider additional dimensions (beyond just income) leads to welfare/poverty rankings that are generally more robust. Finally, a multidimensional approach gives a more realistic welfare situation than a strict focus on just the

income or expenditure of households. Given these advantages, the method of fuzzy sets was adopted for welfare measurement in this study.

2.2.2 **Multinomial and Ordered Response Models**

In econometric models where a qualitative dependent variable has more than two (dichotomous) response categories, the traditional qualitative response models such as the probit and logit cannot be employed to produce unbiased estimates. Often, dependent variables are ordinal, but are not continuous in the sense that the metric used to code the variables is substantively meaningful. With such a dependent variable, a Least Squares regression will have many short-comings from heteroscedasticity, to predicted probabilities outside the unit interval, among others. Therefore, two special classes of qualitative models, known as multinomial and ordered response models are used to solve such polychotomous econometric problems. Two kinds of ordered response models are widely used: the ordered probit and the ordered logit models. On the other hand, the multinomial logit is a commonly employed multinomial response model in the literature.

The generalisation of logistic regression to the multinomial or polychotomous case was pioneered by Gurland, Lee, and Dahm (1960), Mantel (1966), and Theil (1969). Multinomial logit models are employed when more than two outcomes are possible for a dependent variable which cannot be ordered in any natural way. The objective of the model is to derive the probability that an individual belongs to a category j, where $j = 0,\ldots,m$ possible values of the dependent variable. In other words, it involves the determination of the natural logarithm of the odds of the dependent variable taking up a number of possible outcomes, that is, the ratio of the probability of one outcome to the other. A major limitation of the multinomial logit model (arising from the foregoing) is that the ratio of any two possibilities depends only on the parameter vectors and the explanatory variables and, as such, the inclusion or exclusion of other categories is irrelevant to the ratio of the two probabilities. This limitation, which can lead to counter-intuitive behavior, is usually referred to as “independence of irrelevant alternatives”.

The ordered probit model has its origins in bio-statistics but was brought into the social sciences by two political scientists – McKelvey and Zavoina in 1975 when they were both PhD

candidates at the University of Rochester. The central idea is that there is a latent continuous metric underlying the ordinal responses observed by the researcher. Thresholds partition the real line into a series of regions corresponding to the various ordinal categories. The latent continuous variable, *y** is therefore, a linear combination of some predictors, **x**, plus a disturbance term that has a standard Normal distribution as follows: $y_i^* = \mathbf{X}_i\boldsymbol{\beta} + e_i, e \sim N(0,1), \forall i = 1,..., N$; where y_i^* is the observed ordinal variable which takes on values from 0 to *m* as follows: $y_i = j \Leftrightarrow \mu_{j-1} < y_i^* \leq \mu_j$ where $j = 0,\ldots,m$, $\mu_{-1} = -\infty$ and $\mu_m = +\infty$ Therefore, a significant, positive coefficient obtained for a predictor **x** would be interpreted as reinforcing or increasing the probability of the highest bound of y_i while reducing the probability of the lowest bound. As is evident from the foregoing, a major drawback of the ordered probit (and logit) model is the fact that the effects of explanatory variables (predictors) on intermediate responses are ambiguous and as such cannot be reported. Also, the values for the categories of the ordered dependent variable are completely arbitrary and only serve to preserve the order. Thus, expectations, variances, or covariances for values of ordinal variables have no meaning.

The ordered logit model is derived in the same way as the ordered probit model. Therefore, it similarly assumes that the error term is standard logistically distributed (as it is in binary logit models). The similarity in assumptions in both models usually leads to very similar estimation results in practice across these two types of ordered response models. Just as for multinomial logit models, the Maximum Likelihood estimators of ordered logit models can neither be interpreted as the estimators of the effect of the respective explanatory variables nor do they indicate the direction of the estimator of marginal probability effects. This implies that, a positive estimator does not necessarily lead to positive effects.

In general, ordered dependent variable models have a major merit over multinomial response models as the latter ignore the ordering information which leads to inefficient Maximum Likelihood estimators of the parameters compared with the use of ordered response models. Based on this, as well as its flexibility in allowing the use of multiple ordinal categories of the dependent variable, the ordered probit model was adopted for this study.

2.2.3 **Economic Equilibrium Analysis**

Economic equilibrium analysis is concerned with explaining the behaviours and simultaneous interactions of different parts of an economy. Depending on the manner and focus of analysis, it can take the form of either partial or general equilibrium analysis. Partial equilibrium analysis involves analyzing economic behaviour in one part of the economy while taking the other parts as given, as if each component were independent of the other. For instance, a consumer's equilibrium can be analyzed as the state wherein he achieves maximum satisfaction on his expenditure subject to his taste, income, price and supply of the commodity; on the other hand, a firm's (short run) equilibrium is seen as the point where its marginal revenue (MR) equals its marginal cost (MC). The reality, however, is that all components, parts, players and activities in an economic system are interdependent and all prices are determined simultaneously**.**

Furthermore, the complex and simultaneous changes in the economy depend on domestic policies and external events such as changes in international prices. Thus, partial equilibrium analysis is not sufficient for the determination of price and quantity in a given market since both are simultaneously determined. This means that partial equilibrium analysis is also insufficient to analyze policy effects (such as the minimum wage policy), since they usually have multi-sectoral dimensions. Therefore, multi-sector models provide a more useful framework for understanding the effect of a given policy on the economy. The multi-sector model used in this study is the Computable General Equilibrium (CGE) model. Multi-sector models incorporate the interdependence in production, demand and trade in a mixed market economy, thus they are able to capture general equilibrium relationships. Earlier multi-sector models were input-output models which captured very simple general equilibrium relationships but more recent models have achieved higher levels of disaggregation such that they can incorporate various market mechanisms and policy instruments.

General equilibrium analysis can be approached either analytically or numerically. According to Böhringer *et* al., (2004), the numerical approach to general equilibrium study facilitates the analysis of complex economic interactions and the impact assessment of structural policy changes. The primary tools used by researchers for such numerical analysis are computable general equilibrium (CGE) models. They play an important role in applied economic research as

they accommodate the analysis of complex economic problems where analytical solutions are either not available or do not provide adequate information. CGE models are widely employed by various national and international organizations (the CBN, EU Commission, IMF, World Bank, OECD, etc.) for economic policy analysis at the sector-level as well as the economy-wide level.

The main advantage of the CGE approach is its highly consistent representation of price-dependent market interactions. The simultaneous explanation of the origin and spending of the agents' income makes it possible to address both economy-wide efficiency as well as distributional impacts of policy interference. This has made CGE models a standard tool for the quantitative analysis of policy interference in many areas including fiscal policy, trade policy, and environmental policy. However, the computational approach to economic policy analysis also has severe shortcomings of its own, chief among which is the need for specialized programming skills in order to solve the complex system of equations often needed in such models. The CGE model was used in this study in order to properly capture the effects of labour market policy on the rural economy while also incorporating adjustments in the supply and demand sides of the labour market.

2.3 **Empirical Review**

A review of empirical labour market and welfare literature is presented in this section. Section 2.3.1 contains a review of empirical literature bordering on rural household welfare assessment. Section 2.3.2 reviews labour market participation and household welfare literature while literature on labour market policy and household welfare are reviewed in section 2.3.3.

2.3.1 **Rural Household Welfare Assessment**

Adepoju and Obayelu (2013) examined the effect of livelihood diversification on the welfare of rural households in Ondo State, Nigeria employing the FGT method. The primary data for their study was obtained from 143 respondents. The findings reveal that 43% of those sampled were poor. It also reveals that household size, total household income and primary education of the household head were the dominant factors influencing the choice of livelihood strategies adopted; while income from non-farm activities, as well as income from a combination of non-

farm and farming activities, impacted welfare positively relative to income from farming activities. Similarly, studies such as Gaiha *et al*. (2007), Mghenyi (2004) and Baulch and McCulloch (1998) constructed relative poverty lines based on the FGT decomposable poverty methodology using the mean per capita household expenditure as the relative poverty line. The singular dimension to welfare/poverty measurement in these studies indicate that only the effects of explanatory variables on expenditure could be measured without addressing other important welfare dimensions. This drawback is improved upon with the multidimensional welfare measures.

On the other hand, Alkire and Foster (2007) applied a multidimensional poverty approach based on four dimensions: assets, health, schooling and empowerment to household data from the US and India. Comparing their analysis with those based on narrower measures showed that considering additional dimensions led to poverty rankings that were different from the standard-based rankings such as the income-based and results were generally more robust compared to the former. In the same vein, Oyekale and Okunmadewa (2008) applied a multidimensional approach using fuzzy sets to the measurement of poverty in Abia State. They found that poverty drastically reduced when all indicators of welfare were taken into consideration rather than a strict focus on just the income expenditure of households. Also, Oyekale *et al*. (2010), Yusuf (2008), Yusuf and Oni (2008), Okpukpara and Odurukwe (2006), NBS (2005) and Aigbokan (2000) have used these welfare measures. In each case it was found that results were more robust and households were considered to be better off than when their welfare/poverty statuses were assessed using the expenditure approach. However, the results of these studies are somewhat debatable as the effects of some variables on welfare/poverty do not conform to expectation. For example, Oyekale and Okunmadewa (2008) reported an inverse relationship between the age of the household head and its poverty status whereas it is expected *a priori* that as a household head gets older and his productivity reduces, he tends to get poorer. Another major critique of the multidimensional approach used in the reviewed studies is that bunching so many indicators of welfare into a single *super* index prevents the effects of key indicators from standing out.

2.3.2 **Labour Market Participation and Household Welfare**

Matshe and Young (2004) used the double hurdle model to analyse the off-farm labour decisions of small-scale agricultural household members in the Shamva District of Zimbabwe. They jointly modeled the decision to participate in the labour market and the decision regarding the amount of time allocated to work. They found that individual characteristics (such as gender and education) and household farm characteristics (e.g. land area accessible to the household, productive assets, remittances and the agricultural terms of trade) significantly influenced the labour market decisions of rural household members. According to the study, the older a household member gets, being female and having access to credit all reduced the likelihood of participating in off-farm work; while education, asset ownership and the presence of rural infrastructure increased it.

In connection with gender, Vinod and Russel (2010), made similar findings using data from 28 OECD countries (including Australia, Canada, Spain and the United States). They used panel unit root, panel cointegration, Granger causality and long-run structural estimation to examine the relationship between the female labour force participation rate and the total fertility rate. The study revealed that there is a negative relationship between these variables because of the strain of performing the roles of both employee and mother. Olowa and Adeoti (2014) also studied labour market participation (LMP) among women in rural Nigeria using a control function approach. They found that LMP rises with increasing level of education while age has a non-linear effect on women's labour force participation, increasing at first and then decreasing later in life. On the other hand marital status, father's level of education, mother's level of education and land size all increased LMP of women. Maurin and Moschion (2006) conducted a similar study using the control function method. They found that close proximity to other women who participate in the labour market also increases the probability of a woman participating in the labour market. Bedemo *et* al., (2013) found that in Ethiopia, households with better educated heads and with higher number of educated members show a greater tendency to participate in labour markets. Education also enhanced the probability of household members seeking off-farm employment.

Babatunde and Qaim (2011) investigated the effect of off-farm employment on poverty and income inequality in Nigeria using both OLS and Tobit models. Their results indicated that

almost 90% of all households sampled had at least some off-farm income which accounted for 50% of total household income on the average. Sixty-five percent of the households were involved in some type of off-farm employment – 44% in agricultural wage employment, 40% in non-agricultural wage employment, and 50% in self-employed non-farm activities. The share of off-farm income was found to be positively correlated with overall income, indicating that the relatively richer households benefit more from the off-farm sector. Moreover, the share of off-farm income also increased with farm size. The analysis revealed that households with little productive assets and those that are disadvantaged in terms of education and infrastructure were constrained in their ability to participate in more lucrative off-farm activities; thus, off-farm income tended to increase income inequality. However, the use of the Tobit model would likely have censored out the impact of certain extremely poor persons in the sample, thereby affecting the magnitude of the effect of the explanatory variables.

Olugbire *et al* (2011), on the other hand, investigated the impact of non-farm employment (disaggregated by wage- and self- employment) on household income and poverty using a propensity score matching model. The results showed that non-farm wage-employed households in rural Nigeria have a significantly higher income than self-employed households; non-farm wage-employment impacts more on household welfare than non-farm self-employment; and the benefits to non-farm wage-employment are much higher among the non-poor than among the poor. Propensity score estimates tend to be exaggerated and thus the results obtained were not consistent with similar studies (like Bedemo *et* al., 2013) done using other methodologies.

2.3.3 **Labour Market Policy and Household Welfare**

Fernández-Villaverde *et al*., (2006) used a general equilibrium model with heterogeneous agents and firing costs to examine the effect of the policy of liberalizing the use of fixed-term contracts in the Spanish labour market as a means of curbing high unemployment caused by job security laws. They found that fixed-term contracts increased unemployment, reduced output, and raised productivity while the welfare effects were ambiguous. With respect to employment, Mandelman and Zanetti (2008) were able to introduce labour market frictions into their CGE model in order to examine their effect on the response of employment levels in an economy to technological shocks. Their results showed that labour market frictions caused negative reaction of

employment to technological shocks. Both studies did not, however, model skills differentials in the labour force which could have produced more robust results.

Kumar (2007) analyzed the effects of interactions between the minimum wage and the capital tax in the general equilibrium framework. It was found that in the presence of a binding minimum wage, a decrease in the capital tax leads to an increase in wage dispersion. In contrast, when it is not binding, a lower capital tax may reduce the dispersion in wages. A binding minimum wage magnifies the positive effects of a lower capital tax on labour supply, employment, and output. It also enhances the welfare cost of capital tax. He concluded that a policy change which involves an increase in the minimum wage and a fall in the capital tax, such that employment level remains constant, increases welfare and output. André *et al*., (2013), also using the CGE framework, further proposed the strengthening of social safety nets as well as deliberate integration of available labour into the labour market in order to maximise welfare benefits to households. Although cushioning the effect of a strict minimum wage regulation (which increases the cost of labour and thus, the cost of production) through reduced capital tax and social safety nets make economic sense as the recommendations of Kumar (2007) and André *et al*., (2013) indicate, the studies did not consider the formal-informal dichotomy that most modern labour markets experience which could make it difficult to transmit the benefits of the regulation to all households.

With regard to the effects of urban sector minimum wage, Fields and Kanbur (2007) opined that poverty can increase, decrease or remain unchanged with the enforcement of a minimum wage depending on the degree of poverty aversion, the elasticity of labour demand, the ratio of minimum wage to the poverty line and the extent of income sharing. In that regard, Mwangi *et al*., (2015) and Andalon and Pages (2008) noted that enforcing a minimum wage results in high wage differentials in the urban sectors (especially manufacturing) when compared with the agricultural sector and result in a positive effect on the incomes of low-skilled workers in the non-agricultural sectors but an adverse effect on other sectors, especially agriculture.

At times, an urban formal sector minimum wage might result in a “signaling” effect on the informal sector resulting in increased wages in the informal sector (Boeri *et* al., 2010). However,

a number of other studies have found that if minimum wages are enforced in the relatively high-wage urban formal sectors, the effect is likely to be detrimental to the rural and urban informal sectors where the majority of the poor earn their incomes (Gindling and Terrell, 2005; Harrison and Leamer, 1997). Meagher *et al*., (2014), Filho (2012), De la Croix *et* al., (2010) similarly used the CGE method to show that agricultural and labour market policy adjustments in the economy impact on household welfare. Boccanfuso and Savard (2011) ascribed the wage gap between the formal and informal sectors to minimum wages that are set above the equilibrium wage level in the economy which, among other causes, could be the result of the activities of trade unions and other regulations that introduce rigidities into the labour market. Therefore a cut in such minimum wages (for unskilled labour) could result in a reduction in unskilled employment in the short term, formal-informal shifts in labour supply and rural-urban migration. Most of the aforementioned studies did not reflect the duality of the labour market and seemed to make rather general assumptions on the mobility of factors of production, especially labour, across sectors.

2.4 **Conceptual Framework: Labour Welfare Pathway of Rural Households**

Figure 9 shows the conceptual framework of the labour welfare pathway of rural households. Each household is endowed with factors of production – capital, land and labour – which they employ in order to generate income and, by extension, utility. Household welfare is a function of the total amount of utility enjoyed by the household from consumption of goods and services. Capital and land generate rental income for the households translating directly to welfare. However, as regards the labour endowment of households, the pathway to welfare creation follows a sequence. Each rural household seeks to maximise his utility (consumption and leisure) subject to the profit (income) objective. To achieve this, their endowment of time must be split between leisure and labour supply. The aggregate rural labour supply is then split between the rural labour market and the urban due to labour migration. The various chains such a household could be exposed to are shown in figure 9.

The labour market in Nigeria is made up of four different sectors: the formal rural sector, the informal rural sector, the informal urban sector and the formal urban sector. As seen in figure 9, the decisions of individual rural households to supply their endowment of time for work (labour

market participation) rather than leisure, determines the aggregate supply of rural labour as follows:

$$E_i^L - \ell_i = L_i^f + L_i^m \qquad (4)$$

Where E_i^L represents an individual's endowment of time, ℓ_i represents leisure, L_i^f represents labour expended on family farms/enterprises and L_i^m represents marketed labour. By means of rural-urban migration brought about by the pull of higher urban wages, some of the marketed rural labour gets drained into the urban sector labour market where they can be employed either in the formal or informal sector. The rural labour supply on the other hand, is either employed in the rural formal or informal sector. Informal sector activities in the rural areas are dominated by agriculture, therefore wages earned therein can be disaggregated into on-farm labour wages, off-farm labour wages as well as a combination of on-farm plus off-farm wages.

Part of the dynamics of the labour market (rural or urban) is seen in the shifts of labour supply within and between sectors. For instance, labour supply has a tendency to shift from the farm to more lucrative off-farm opportunities as suppliers of labour seek to improve their incomes and escape income insecurity and poverty. Similar considerations can also cause intersectoral shifts in labour supply between the formal urban and informal urban sectors.

With regard to outcomes, low asset ownership of households and poor informal wages tend to increase the threat of poverty. This is the realm of expected government intervention in the labour market (see figure 9) to protect the rural household (suppliers of labour) through properly tailored wage policy that seeks to regulate the informal sector wherein most rural households supply their labour. The minimum wage policy is the major labour market wage regulation in Nigeria and it is largely restricted to the formal sectors (Fapohunda, 1979). This situation can result in negative welfare outcomes for informal sector workers while it protects formal sector employees (Lemos, 2004; Fields, 2004).

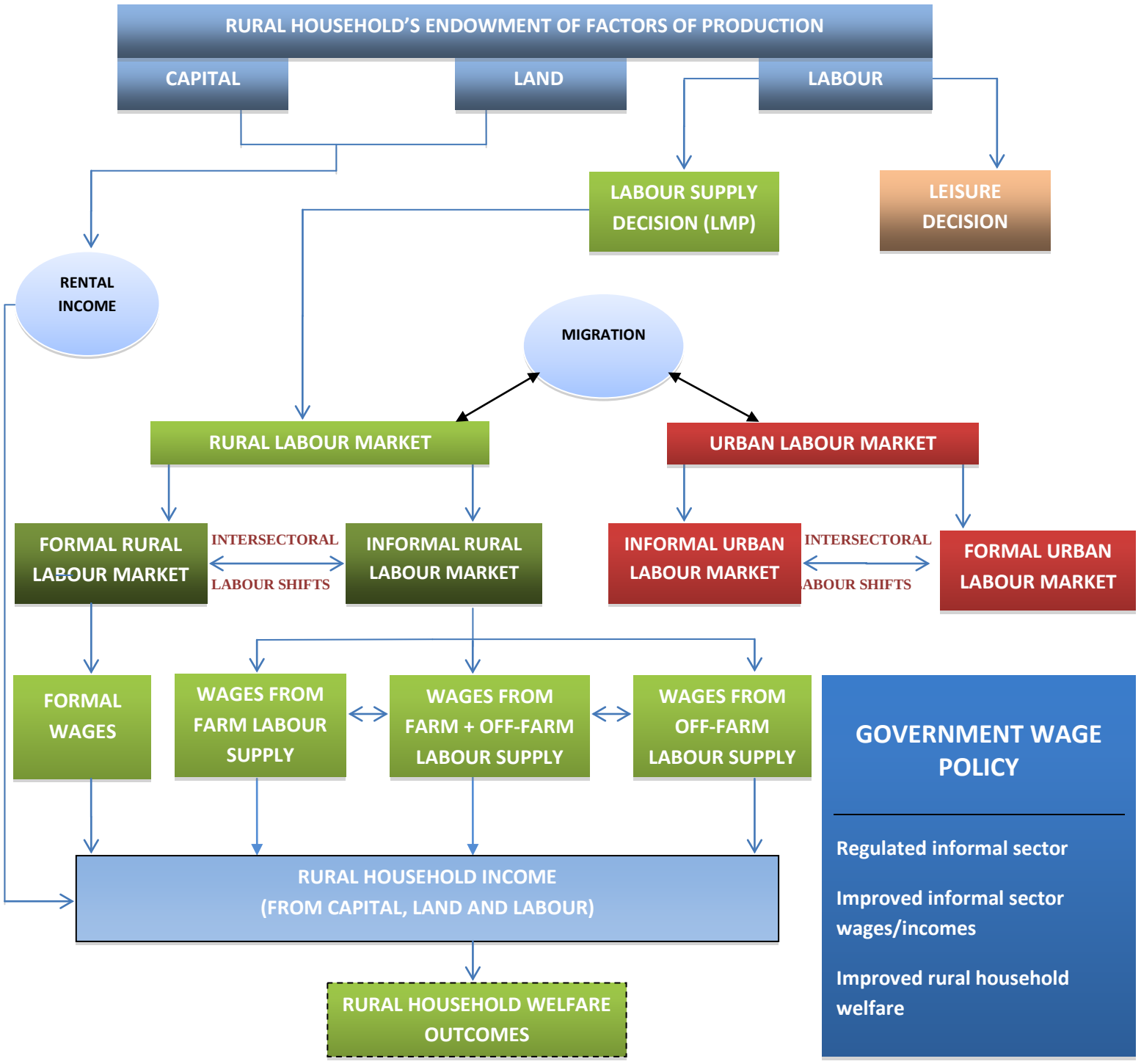


Figure 9: Labour Welfare Pathway of Rural Households.

Source: Adapted from Fields (2004) and Mankiw (2012).

CHAPTER THREE

RESEARCH METHODOLOGY

This section provides a description of the methodological framework for the study. It includes the scope of the study, the sources and types of data employed and the methods of data analysis.

3.1 Scope of Study

This study sought to investigate the effects of labour market wage policy on the rural economy and household welfare in Nigeria. Specifically, it investigated how labour market participation affects the welfare of rural households as well as the effects of the minimum wage policy on the rural economy and household welfare. The focus of the study was narrowed down to rural Nigeria even though the entire country was modeled. The last Nigerian National Population Census (NPC) in 2006 recorded a population of around 140 million people with approximately 70% residing in the country's rural areas. The domestic labour policy considered for this study (the minimum wage policy) was modeled as increases or decreases in the respective variables using a static CGE model. The study used an urban-rural disaggregation of households. Further, the households were separated into formal and informal sectors of employment. A third level of disaggregation of the households was done on the basis of their welfare status as non-poor, moderately poor or core poor. Thus 12 household categories were used for analysis. Labour was modeled as being mobile across sectors and substitutable between skilled and unskilled categories.

3.2 Sources and Types of Data

Secondary data employed for this study was sourced from the following:

i. World Bank sponsored General Household Survey (GHS) panel (Wave II, 2010/2011) from which data such as household socioeconomic attributes, labour supply and demand, labour wages, gender dimensions to labour use, labour market participation and assets ownership were generated. As at the time this study was conducted, two waves of the GHS data were available (2010/2011 and 2012/2013). They contained data for both the post-planting and post-harvest periods bordering on household, community and agricultural information.

ii. The National Bureau of Statistics (NBS) which supplied data on formal and informal output across economic sectors in Nigeria for the year 2010 and import taxes across economic sectors in Nigeria for 2011.
iii. The Central Bank of Nigeria (CBN) Statistical Bulletins and Annual Reports for 2012 from which relevant macroeconomic data were obtained.
iv. The Nigerian Institute of Social and Economic Research (NISER) from where the 2011 Nigeria Input-Output (I-O) table was obtained which was used to generate the SAM for the study.

3.3 **Methods of Data Analysis**

The data obtained for study were analysed using descriptive statistics, the fuzzy sets method, the Heckman double huddle method, ordered probit regression and the Computable General Equilibrium method.

3.3.1 **Descriptive Analysis**

An eclectic approach was adopted to provide a profile of the rural labour market in Nigeria. Tables, frequency distributions, graphs, measures of central tendency, percentages, standard deviations, among others, were used to provide general information respecting the population of study. In addition, income inequality was measured using the Gini approach presented as follows:

The Gini Coefficient

The Gini coefficient was used to measure income inequality and compared across different groups in the rural population. For a population uniform on the values y_i, where $i = 1 \ldots n$, indexed in a non-decreasing order ($y_i \leq y_{i+1}$), the Gini coefficient was computed by equation 5 given as:

$$G = \frac{1}{n}\left(n+1-2\left(\frac{\sum_{i=1}^{n}(n+1-i)y_i}{\sum_{i=1}^{n} y_i} \right) \right) \qquad (5)$$

Where G = Gini coefficient (0 = perfect equality; 1 = perfect inequality)

n = Population size of rural Nigeria based on the GHS data

y_i = income of the i^{th} household

3.3.2 **Fuzzy Sets Model**

In order to assess the welfare of households the fuzzy sets method was used. The method involved the use of various socio-economic attributes to generate a welfare index for each household. The attributes used include ownership of household assets (such as furniture, generators, vehicles, land, farm machines among others), the educational status of the household head as well as household-reported cases (or otherwise) of food consumption insufficiency.

The degree of membership of the i-th household to the Fuzzy sub-set β was defined as a weighted average of Xij. Household welfare indicators used in the study took the form of simple 'yes/no' dichotomies, in which case X_{ij} is either 0 or 1. The welfare ratio of a household, $\mu_\beta(a_i)$ which shows the level of welfare and membership to set B, was defined as the weighted average of X_{ij} given by:

$$\mu_\beta(a_i) = \sum_{j=1}^{m} x_{ij} w_j / \sum_{j=1}^{m} w_j \qquad (6)$$

where w_j is the weight attached to the j-th attribute. The intensity of household welfare with respect to X_j is measured by the weight w_j, was computed as:

$$w_j = \log\left[\sum_{i=1}^{n} g(a_i) / \sum_{i=1}^{n} x_{ij} g(a_i)\right] \geq 0 \qquad (7)$$

where $\sum_{i=1}^{n} g(a_i)$ represents the sample size (1,319) of households taken from the population.

Table 5 (see appendix) contains the attributes that were used to generate welfare indices among the households.

3.3.3 **The Heckman Model**

In fulfilling study objective two, it was necessary to test for endogeneity bias between the key variables: household welfare and labour market participation (LMP). The Heckman model was employed to determine the presence or otherwise of endogeneity bias while regressing the household welfare status in rural Nigeria on the labour market participation (LMP) decision of household heads. Following Briggs (2004), the model applied is given by:

$$Y_i = a + bLMP + \mathbf{X}_i\mathbf{c} + \sigma\varepsilon_i \quad (8)$$

$$LMP_i = 1 \Leftrightarrow \alpha + \mathbf{Z}_i\mathbf{g} + \delta_i > 0 \quad (9)$$

Equations (8) and (9) are based on the following assumptions:

i. ε_i, δ_i follow a standard normal distribution

ii. $\{\mathbf{X}_i: I = 1, \ldots, N\}$ is independent of $\{\varepsilon_i: I = 1, \ldots, N\}$

iii. $\{\mathbf{Z}_i: I = 1, \ldots, N\}$ is independent of $\{\delta_i: I = 1, \ldots, N\}$

Where;

Y_i = Welfare status of the ith household (poor = 1, 0 otherwise)

LMP = Labour market participation decision of the household (participates = 1, 0 otherwise)

$\mathbf{X}_i$ = Vector of observed exogenous covariates of the dependent variable

ε_i = The error term which represents the deviation of Y_i from its expected value

$\mathbf{Z}_i$ = Vector of observed covariates of labour market participation decision

δ_i = Latent covariates of labour market participation decision

a, b, c, σ, α, and g = parameters to be estimated

Equation (8) is the response function while (9) is the selection function. The response function shows that the welfare status of a household (Y_i) is a function of some unobservable determinants ($\sigma\varepsilon_i$) and the decision to participate or not in the labour market (LMP) which is

itself a function of other factors ($\mathbf{Z}_i\mathbf{g}$) which are not correlated with the welfare status (Y_i) as well as certain unobserved factors (δ_i) as shown by the selection function.

If ε_i and δ_i are not correlated, then ρ (the correlation coefficient between them) = 0, and there would be no selection bias problem. However, where $\rho \neq 0$, LMP is endogenous, thus $E(\varepsilon_i \mid LMP_i, \mathbf{X}_i) \neq 0$. The Heckman Model strategy is, therefore, to get an estimate for this term, and then treat it as an observable confounder of the relationship between welfare and labour market participation.

$$\text{Let; } \lambda = E(\varepsilon_i \mid LMP_i, \mathbf{X}_i) \neq 0 \qquad (10)$$

If λ were known for the i^{th} household, then regressing Y_i on a constant, LMP_i, $\mathbf{X}_i$ and λ_i would produce unbiased parameter estimates for *a*, *b*, **c** and *h*, where *h* is the regression coefficient associated with λ_i. λ is also known as the inverse Mills ratio or the hazard rate.

$$\text{i.e. } E(\varepsilon_i - \lambda_i \mid LMP_i, \mathbf{X}_i) = 0 \qquad (11)$$

Given (12) and the assumptions of the Heckman Model, then selection bias would have been purged from the estimate of *b* in (8). λ_i is calculated as a function of the estimated parameters in the selection function. Thus it is accepted that LMP_i becomes a true covariate of Y_i while the selection bias is attributed to λ_i. Heckman (1979) showed that $\hat{b}$ will converge asymptotically to *b*, so $\hat{b}$ will be biased but consistent. Thus the model to be estimated will be:

$$Y_i = a + bLMP_i + \mathbf{X_i c} + h\lambda_i(LMP_i, \hat{s}_i) + \varepsilon_i^* \qquad (12)$$

$$\hat{s}_i = \alpha + \mathbf{Z}_i\mathbf{g} \qquad (13)$$

$$\varepsilon_i^* = \sigma\varepsilon_i - h\lambda_i(LMP_i, \hat{s}_i) \qquad (14)$$

The variables in the model are as follows:

X_1 = Age of household head (Years)

X_2 = Square of age of household head (Years)

X_3 = Sex of household head (Dummy; Male = 1, 0 if otherwise)

X_4 = Marital status of household head (Dummy; Married =1, 0 if otherwise)

X_5 = Household size (Number)

X_6 = Farm size (Hectares)

X_7 = Social group membership (Dummy; Belongs to a socioeconomic group = 1, 0 if otherwise)

X_8 = Household income (farm + non-farm) (Naira)

X_9 = Primary occupation in agriculture (Dummy; Agric. Primary occupation = 1, 0 if otherwise)

X_{10} = Credit access of household head (Dummy; Has access = 1, 0 if otherwise)

X_{11} = Labour market participation decision of household head (Participates = 1, 0 if otherwise)

The Heckman estimation produced an insignificant Inverse Mills Ratio (λ) (See table 14), indicating the absence of endogeneity bias. Thus the ordered probit model was employed.

3.3.4 **The Ordered Probit Model**

The ordered probit model was used to analyse the effect of labour market participation on rural household welfare. The dependent variable (Y) was generated as 3 ordered categories of household welfare ranging from low to moderate to high welfare. Following Wooldridge (2002), given that Y is an ordered response taking values of 0, 1 or 2 for household welfare, the ordered probit model for Y conditional on explanatory variables $\mathbf{X_i}$ can be derived from a latent variable model. Given that the model is expressed as:

$$Y = \mathbf{X}\beta + e \qquad e/\mathbf{X} \sim Normal(0,1) \qquad (15)$$

Let $\alpha_1 < \alpha_2 < ... < \alpha_j$ be unknown cut-off points or threshold parameters. Y can, therefore, be defined as follows:

$$Y = 0, \qquad \text{if } Y \le \alpha_1 \qquad (16)$$

$$Y = 1, \qquad \text{if } \alpha_1 < Y \le \alpha_2 \qquad (17)$$

$$\vdots$$

$$Y = \text{j}, \qquad \text{if } Y > \alpha_j \qquad (18)$$

Based on the assumption of normality of the error term (*e*), the conditional distribution of Y given $\mathbf{X}$ can be simply derived from each of the response probabilities (in equations 19 – 21) as follows:

$$P(Y=0|\mathbf{X}) = P(Y \le \alpha_1|\mathbf{X}) = P(\mathbf{X}\beta + e \le \alpha_1|\mathbf{X}) = \Psi(\alpha_1 - \mathbf{X}\beta) \quad (19)$$

$$P(Y=1|\mathbf{X}) = P(\alpha_1 < Y \le \alpha_2|\mathbf{X}) = \Psi(\alpha_2 - \mathbf{X}\beta) - \Psi(\alpha_1 - \mathbf{X}\beta) \quad (20)$$

$$\vdots$$

$$P(Y=j-1|\mathbf{X}) = P(\alpha_{j-1} < Y \le \alpha_j|\mathbf{X}) = \Psi(\alpha_j - \mathbf{X}\beta) - \Psi(\alpha_{j-1} - \mathbf{X}\beta) \quad (21)$$

$$\text{Similarly, } P(Y=j|\mathbf{X}) = P(Y > \alpha_j|\mathbf{X}) = 1 - \Psi(\alpha_j - \mathbf{X}\beta) \quad (22)$$

The parameters α and β can be estimated by maximum likelihood and the model can be simply stated as follows for *i* households:

$$Y_i = \mathbf{X_i}\beta + \varepsilon_i \quad (23)$$

Y_i is the household welfare status. Households were classified as having low, medium or high welfare relative to the overall MWI generated from the fuzzy analysis. Households with MWI greater than or equal to one-third of the overall MWI but less than two-third were regarded as having low welfare (*Y = 0*), those with MWI greater than or equal to two-thirds of the overall MWI but less than the overall MWI were categorized as having medium welfare (*Y = 1*) while those with MWI greater than or equal to the overall MWI were considered to be high welfare households (*Y = 2*). X_i represents a vector of explanatory variables regressed on the endogenous variable including the following:

X_1 = Labour market participation decision of household head (Participates = 1, 0 if otherwise)
X_2 = Age of household head (Years)
X_3 = Square of age of household head (Years)
X_4 = Sex of household head (Dummy; Male = 1, 0 if otherwise)
X_5 = Marital status of household head (Dummy; Married =1, 0 if otherwise)
X_6 = Household size (Number)
X_7 = Seasonal man-hours worked (Hours)

X_8 = Farm size (Hectares)

X_9 = Total income of household head (Naira)

X_{10} = Social group membership (Dummy; Belongs to a socioeconomic group = 1, 0 if otherwise)

X_{11} = Credit access of household head (Dummy; Has access = 1, 0 if otherwise)

Labour market participation (X_1) is the key exogenous variable in model. Any household head who supplies labour in exchange for wages is deemed to have participated in the labour market. Labour market participation affects household welfare through the wage income earned from labour activities and is expected to be negatively related to the dependent variable (rural household welfare) due to its meager, unregulated nature in the informal sector in Nigeria. It is conceived as a dummy variable. **Age of the household head (X_2)** is a continuous variable and it captures the effect of the age of the household head (which is linked to productivity) on the welfare of the household. Age is expected to be inversely proportionate to welfare (Y). **Square of age of household head (X_3)**, on the other hand, captures lifecycle effects of the variable on welfare. **Sex of the household head (X_4)** is a dummy variable meant to reveal whether being a male-headed or female-headed household is significant to the welfare of households.

Similarly, **marital status of the household head (X_5)** is a dummy variable which shows whether a household head's being married (1) or not (0) affects welfare. The variable is expected to have a negative coefficient, indicating that a household head's being single (0) reduces household welfare. **Household size (X_6)** is a continuous variable measured as the number of persons living together under the same roof, answering to the same head and sharing a common source of income. It is believed that larger households would have lower welfare, thus the variable is expected to have a negative coefficient. **Seasonal man-hours worked (X_7)** is a continuous variable which captures the amount of labour input by the household heads. Those that did not participate in the labour market were considered to have zero man-hours while the man-hours input of participants were captured as continuous data. The variable is expected to be positively related to household welfare as more labour input usually translates into more wages/income.

Farm size (X_8) is a continuous variable capturing the land holdings of the household heads in acres. It is expected that farm size would be directly proportional to welfare. **Total income of**

household head (X_9) represents income from both farm and off-farm sources. It was measured in Naira. It is expected that the higher the income of the household, the better-off they are in terms of welfare. **Social capital (X_{10})** is a dummy variable which indicates whether the household head belongs to a socioeconomic group (1) or not (0). Social capital is expected to enhance household welfare. **Credit access (X_{11})** was similarly conceived as a dummy variable indicating whether a household head has access to credit (1) or not (0). The credit sources captured were formal institutions, informal groups, friends and relatives. Access to credit is expected to be positively related to the welfare of the household.

Table 2: List of Regression Variables and their *A Priori* Signs

Variables	Description	Units	Expected Signs	Selected Literature
LMP	Nominal	Dummy	-	Sitienei *et al* (2013)
Age	Discreet	Years	-	Sitienei *et al* (2013); Adepoju and Obayelu (2013), Harjes (2007)
Age^2	Discreet	Years	-	Bedemo *et al*., (2013); Heitmueller (2006)
Sex	Nominal	Dummy	+	Tijani *et al*., (2010) ; Black *et al*., (2013)
Marital status	Nominal	Dummy	-	Tijani *et al*., (2010); Heitmueller (2006); Porterfield (2001)
Household size	Discreet	Number	-	Bedemo *et al*., (2013); Heitmueller (2006)
Monthly man-hours	Continuous	Number	-	
Farm size	Continuous	Hectares	+	Agwu *et al* (2012); Tijani *et al*., (2010)
Total income	Continuous	Naira	+	Adepoju and Obayelu (2013)
Social capital	Nominal	Dummy	+	Oluwatayo (2009), Yusuf (2008)
Credit access	Nominal	Dummy	+	Bedemo *et al*., (2013)

3.3.5 **Social Accounting Matrix (SAM)**

The SAM for this study was built to show the intersectoral income flows within the Nigerian economy for the accounting year 2011, with particular interest in the remuneration to the major factors of production (labour and capital) in order to fulfill objectives three and four. It is a 20 by 20 square matrix extracted from the 2011 Input-Output (I-O) table for Nigeria showing monetary flows in Naira across the different sectors of the economy and the rest of the world (ROW). The SAM is presented in table 24 in the appendix section of this report. The sectors aggregated from the I-O table to form the SAM are shown in table 3.

3.3.5.1 **Production Sectors in the SAM**

Five production sectors of interest were aggregated from the 2011 I-O table as shown in table 3. Due to the importance of crop production as a major employer of agricultural labour (and thus its importance to this study), the sub-sector was separated from other agricultural activities in the I-O table. This resulted in the 5 sectors used for the analysis. The output from each of the 5 sectors that was consumed domestically for that year was entered in the intersection of each activity row with its commodity column in the SAM. The figures were obtained by netting off exports from gross output for each sector. The exports values were obtained directly from the I-O table and entered in the intersection of each activity sector with the ROW.

3.3.5.2 **Commodities in the SAM**

Intersectoral income flows within and among the sectors were entered in the intersections of commodity rows with activity columns. They were obtained directly from the I-O table and they reflect the economic interactions of the sectors with one another. Household and government consumption of commodities were entered in the intersection of the commodity rows of each sector and the household and government columns respectively.

3.3.5.3 **Factors in the SAM**

Two factors of production are shown on the basic SAM matrix: Labour and Capital. Entries in the labour account were obtained from the "compensation of employees" row in the I-O table while capital entries were gotten from the "operating surplus" row. However, labour was further broken down into skilled and unskilled labour according to proportions computed from Oluyomi (2015) with respect to generic skills demand in different sectors of the Nigerian economy. Furthermore, land was disaggregated from capital due to its importance in agriculture (especially crop production). Based on the work of Eke and Effiong (2016), land to capital percentage ratios used for the disaggregation were: 60:40 for CRP, 40:60 for OAG, 20:80 for COM, 30:70 for MAN and 25:75 for UTS.

Table 3: SAM Sectors Aggregated from I-O Table.

SAM sectors	Components from the I-O sectors
Crop Production (CRP)	Crop production
Other Agriculture (OAG)	Livestock, forestry and fisheries
Crude Oil and Mining (COM)	Crude petroleum and natural gas, coal mining, metal ores, other mining and quarrying and oil refining
Manufacturing (MAN)	Cement and other manufacturing
Utilities and Services (UTS)	Electricity, water, building and construction, road transport, rail transport and pipelines, water transport, air transport, transport services, telecommunications, post, distributive trade (wholesale and retail), hotels and restaurants, financial institutions, insurance, real estates, business services (not health or education), public administration, education, health, private non-profit organizations, other services and broadcasting

Source: 2011 Input-Output Table for Nigeria by NISER.

3.3.5.4 **Households in the SAM**

The single household in the I-O table was first disaggregated, using the GHS 2010/11 data, into rural and urban households. Next, both households were split into 2 categories each based on whether they earned their incomes from formal or informal sources using the NBS data on formal and informal sectors' output in Nigeria for 2010. Finally, each of the four households was disaggregated into 3, on the basis of their poverty/welfare situation, into non poor, moderately poor and core poor households using the fuzzy sets method based on the GHS 2010/11 data. This gave rise to 12 households used for the analysis: formal urban non poor (FUN), formal urban moderately poor (FUM), formal urban core poor (FUC), informal urban non poor (IUN), informal urban moderately poor (IUM), informal urban core poor (IUC), formal rural non poor (FRN), formal rural moderately poor (FRM), formal rural core poor (FRC), informal rural non poor (IRN), informal rural moderately poor (IRM) and informal rural core poor (IRC) households. The households' incomes were split into skilled labour, unskilled labour, capital and

land incomes (Oluyomi, 2015; Eke and Effiong, 2016). Also the expenditure of the single household in the I-O on each sector's output was disaggregated for the 12 household categories based on the GHS 2010/11 data. Household savings in the SAM was computed as the difference between their total income (from labour and capital) and their total consumption expenditure from the 5 sectors.

3.3.5.5 **Government in the SAM**

Government is one of the consumers of the output of the 5 sectors. Government consumption was obtained directly from the I-O table and entered into the intersection of the commodity rows and the government column. Government income comes from the sum of import taxes collected on imported intermediate and finished goods, indirect taxes levied on domestic commodities and subsidies paid to the sectors. Subsidies to the sectors are, however, introduced into the SAM as negative entries since they are leakages from the government. Indirect taxes and subsidy were obtained directly from the I-O while import taxes for the base year 2011 were gotten from the Central Bank of Nigeria (CBN) statistical bulletin. The difference between government's total revenue and total consumption constituted its savings. This was entered in the intersection between the capital account (or investment) row and the government column.

3.3.5.6 **Other Accounts in the SAM**

The income received by the rest of the world is made up of intermediate imports and final imports. The values of intermediate imports by sector were directly extracted from the "non competitive imports" row while the final import values were derived from the "imports" column of the I-O table. The intermediate and final import taxes obtained from the CBN were then netted off from the values of intermediate and final imports to obtain the actual incomes of the ROW from each sector which were then introduced into the ROW row of the SAM under activity and commodity columns respectively.

The capital account represents savings in the economy. Therefore, each sector's "consumption of fixed capital" row entry in the I-O table was entered in the capital account row; this is the provision for depreciation by each firm which constitutes their savings. Savings of households and government were obtained by subtracting their total expenditure from total income and the

values were entered in the capital account row, under the corresponding columns. Similarly, ROW savings was obtained by subtracting the value of total exports (which is the expenditure of the ROW) from the sum of total intermediate and final imports. The net figure was then entered in the capital account row under the ROW column.

3.3.6 **The Computable General Equilibrium (CGE) Model**

The study employed an applied CGE model. The calibration of the model was based on the 2011 Input-Output (I-O) table for Nigeria developed by NISER. Five different sectors of interest to this study were aggregated from the I-O table with some sectors being merged for analytical convenience. These are the crop production sector, other agriculture sector (comprising livestock, forestry and fisheries), the crude oil and mining sector, the manufacturing sector, and the utilities and services sector (comprising building and construction, transportation, communication, wholesale, finance and insurance and other services). Like the general CGE models, the components of the model were separated into equation blocks (see appendix) which were simultaneously solved using GAMS. A static CGE model of the Nigerian economy (based on the SAM extracted from the 2011 I-O table) was produced to simulate the effects of changes in minimum wage on the rural economy and household welfare. Further, the multidimensional poverty status of households was used as proxy for household welfare in the model. The model was divided into six blocks: price block, output block, demand and income equations, utility block, savings and investment block and the market clearing and factor market equilibrium.

3.3.6.1 **Definition of Parameters and Variables in the Model**

The parameters and variables in the CGE model are shown and explained below:

i. ***Parameters in the Model***

$h\exp s_{(h,i)}$	-	Expenditure shares of household *h* on sector *i*
$hfylss_{(h,i)}$	-	Household shares of factor income from skilled labour
$hfylsu_{(h,i)}$	-	Household shares of factor income from unskilled labour
$hfyks_{(h,i)}$	-	Household shares of factor income from capital
$hfylas_{(h,i)}$	-	Household shares of factor income from land
$savr_{(h)}$	-	Savings rate of household h

IO_{ij}	-	Input-output coefficient
$\alpha_{(i)}$	-	Value-added share parameter by sector
$\delta_{(i)}$	-	Armington function share parameter
$\beta_{(i)}$	-	CET function share parameter
$shlabsu_{(i)}$	-	Share parameter for composite labour (skilled and unskilled)
$shcala_{(i)}$	-	Share parameter for composite capital and land
$shpsu_{(i)}$	-	Share parameter for composite prices of labour (skilled and unskilled)
$shpcl_{(i)}$	-	Share parameter for composite prices of capital and land
$shlsucl_{(i)}$	-	Share parameter for composite labour capital and land
$av_{(i)}$	-	Value-added shift parameter
$ac_{(i)}$	-	Armington function shift parameter
$apl_{(i)}$	-	Composite labour function shift parameter
$acl_{(i)}$	-	Composite capital and land function shift parameter
$at_{(i)}$	-	CET function shift parameter
$alp_{(i)}$	-	CES shift parameter for composite labour prices (skilled and unskilled)
$alc_{(i)}$	-	CES shift parameter for composite capital-land prices
$alcl_{(i)}$	-	Composite labour capital and land function shift parameter
$rhov_{(i)}$	-	Value-added exponent
$rhoc_{(i)}$	-	Armington function exponent
$rhol_{(i)}$	-	Labour CES function exponent
$rhok_{(i)}$	-	Capital land CES function exponent
$rholk_{(i)}$	-	Labour capital land CES function exponent

$rhopl_{(i)}$	-	Labour prices CES exponent
$rhopk_{(i)}$	-	Capital-land prices CES exponent
$rhot_{(i)}$	-	CET function exponent
$g\,\mathrm{sec}_{(i)}$	-	Share of each sector in government sectoral consumption
$depr_{(i)}$	-	Sectoral depreciation rate
$ksh_{(i)}$	-	Sectoral investment share
$pwts_{(i)}$	-	Consumer price index weights
$sigv_{(i)}$	-	Value-added elasticity
$sigc_{(i)}$	-	Composite good elasticity
$sigt_{(i)}$	-	CET elasticity
$tm_{(i)}$	-	Import duty rate on final good
$tn_{(i)}$	-	Import duty rate on intermediate good
$td_{(i)}$	-	Excise duty rate on domestic good
$te_{(i)}$	-	Export duty rate
$sub_{(i)}$	-	Sectoral subsidy
$nx_{(i)}$	-	Ratio of imported intermediate to output
$ta_{(i)}$	-	Tax and subsidy rates
govsavr	-	Government savings rate
er	-	Exchange rate

ii. ***Variables in the Model***

$HEXP_{(i)}$	-	Household expenditure by sector
$HFYLS_{(i)}$	-	Household factor income from skilled labour by sector
$HFYLU_{(i)}$	-	Household factor income from unskilled labour by sector
$HFYK_{(i)}$	-	Household factor income from capital by sector

$HFYL_{(i)}$	-	Household factor income from land by sector
$SAV_{(h)}$	-	Savings of household *h*
$HHY_{(h)}$	-	Household's income (gross)
$HHYN_{(h)}$	-	Household's income (net)
$HEXPQ_{(h,i)}$	-	Quantity of composite commodity consumed by household
$HHU_{(h)}$	-	Household utility
$AL_{(i,j)}$	-	Input-output entries
$QSUM$	-	Variable for calibration of pwts
$PX_{(i)}$	-	Price of goods produced by sector
$PP_{(i)}$	-	Producer price by sector
$DFI_{(i)}$	-	Price of foreign input by sector
$PD_{(i)}$	-	Price of goods sold locally by sector
$PK_{(i)}$	-	Price of capital by sector
$PL_{(i)}$	-	Price of land
$PW1$	-	Price of skilled labour
$PW2$	-	Price of unskilled labour
$PW12_{(i)}$	-	Price of composite labour
$PKL_{(i)}$	-	Price of composite capital-land
$PV_{(i)}$	-	Price of value-added
$P_{(i)}$	-	Price of composite by sector
$PE_{(i)}$	-	Domestic price of export
$PM_{(i)}$	-	Domestic price of import
$PN_{(i)}$	-	Domestic price of intermediate import
$LABS_{(i)}$	-	Skilled labour demanded by sector
$LABU_{(i)}$	-	Unskilled labour demanded by sector

$CAP_{(i)}$	-	Capital demanded by sector
$LAN_{(i)}$	-	Land demanded by sector
$LABSU_{(i)}$	-	Composite labour (skilled & unskilled) demanded by sector
$CALA_{(i)}$	-	Composite capital and land demanded by sector
$LSUCL_{(i)}$	-	Composite labour capital and land demanded by sector
Q_i	-	Composite final good by sector
$X_{(i)}$	-	Domestic output by sector
$D_{(i)}$	-	Domestic supply of good produced locally by sector
$E_{(i)}$	-	Export of goods produced locally by sector
$M_{(i)}$	-	Import of final good by sector
$N_{(i)}$	-	Imported intermediate good by sector
$XV_{(i)}$	-	Value-added output by sector
$INTO_{(i)}$	-	Intermediate input supply by sector
$CD_{(i)}$	-	Households private consumption on sector *i*
$IDO_{(i)}$	-	Investment demand in sector *i*
$INTDO_{(i)}$	-	Sectoral intermediate input supply
LABYS	-	Skilled labour income (total)
LABYU	-	Unskilled labour income (total)
NCAPY	-	Capital income (net)
CAPY	-	Capital income (gross)
LANY	-	Land income (gross)
PINDEX	-	Price index
GDP	-	Net gross domestic product
*GDP*2	-	Gross domestic product expenditure approach
RGDP	-	Real gross domestic product
IMTAX	-	Import duty collected on all goods across sectors
INDTAX	-	Indirect tax collected on all goods across sectors

$GRTOT$	-	Government revenue (total)
$GETOT$	-	Government expenditure (total)
$NGETOT$	-	Net government expenditure
$GOVSUB$	-	Subsidy
$GEXP_{(i)}$	-	Government sectoral expenditure
$HSAV$	-	Households savings
$GOVSAV$	-	Government savings
$DEPTOT$	-	Depreciation total
$SAVINGS$	-	Total savings
$INVEST$	-	Investment
$SAVR_{(h)}$	-	Savings rate of households
$FSAV$	-	Foreign savings
$PWE_{(i)}$	-	World price of export
$PWM_{(i)}$	-	World price of final import
$PWN_{(i)}$	-	World price of intermediate import
$DPRE_{(i)}$	-	Depreciation value by sector
LS	-	Total skilled labour supply
LU	-	Total unskilled labour supply
K	-	Total capital supply
L	-	Total land supply
$TMR_{(i)}$	-	Import duty revenue on final goods by sector
$TNR_{(i)}$	-	Import duty revenue on intermediate goods by sector
$TDR_{(i)}$	-	Indirect tax revenue by sector
$SUBR_{(i)}$	-	Government subsidy by sector

3.3.6.2 **Equation Blocks in the Model**

The CGE model for this study is made up of 49 equations which were divided into 6 different equation blocks as described in the following sections:

a. **Price Block**

There are 7 equations making up the price block as follows:

i. The price of the value-added of a commodity was computed as the difference between the value of production and the value of the intermediate inputs used in producing the commodity:

$$PV_i = PX_i\left(1-(td_i - sub_i)\right) - \sum(IO_{ji}.P_j) - PN_i.nx_i \qquad (24)$$

ii. The price of final imports in the domestic economy was derived as a function of the nominal exchange rate and the world price of the final import. A small economy closure rule was adopted in the model, therefore exchange rate was endogenized:

$$PM_{im} = ER \cdot PWM_{im} \qquad (25)$$

iii. The domestic price of intermediate imports was derived as a function of the world prices of the imported intermediate commodities and the nominal exchange rate:

$$PN_{in} = ER \cdot PWN_{in} \qquad (26)$$

iv. The export price enjoyed in the domestic economy was computed as a function of the nominal exchange rate and the world price of the exported commodities:

$$PE_{ie} = ER \cdot PWE_{ie} \qquad (27)$$

v. The composite price was derived as the sum of the values of production of domestic goods and exports:

$$P_i = PD_i.D_i + PM_i.M_i.\frac{M_i}{Q_i} \qquad (28)$$

vi. The value of domestic output was computed as a function of the value of production of domestic goods, value of exports and the total domestic output:

$$PX_i = \left(PD_i \cdot D_i + PE_{ie} \cdot E_i\right)/X_i \qquad (29)$$

vii. The price index (the *numeraire*) was derived as the sum of the shares of the output from the sectors multiplied by the price of composite:

$$PINDEX = \sum pwts_i . P_i \qquad (30)$$

b. **Output Block**

The output block contains 10 equations as follows:

viii. The value added output in each sector was a constant elasticity of substitution (CES) function of the composite skilled and unskilled labour input as well as the input of composite capital and land:

$$XV_i = alcl_i \left[\left(shlsucl_i \cdot LABSU_i^{-rholk_i} \right) + \left(1 - shlsucl_i \cdot CALA_i^{-rholk_i} \right) \right]^{-1/rholk_i} \qquad (31)$$

ix. The demand functions for the primary inputs or factors of production were derived as CES functions of the profit maximizing combinations of subtypes of the inputs used. Thus the demand for labour was given as a function of the proportions of skilled and unskilled labour used and their respective prices:

$$LABS_i / LABU_i = \left(PW1 / PW2 \right)^{1/rhol_i + 1} \left(shlabsu_i / 1 - shlabsu_i \right)^{1/rhol_i + 1} \qquad (32)$$

x. Land, as an input in production, is often classified under capital. However, since land is a critical factor in agricultural/rural economic activities, a dichotomy had to be created between land and other capital inputs for this study. Thus a composite capital-land share parameter ($shcala_i$) was defined. The demand for capital and land was, therefore, derived as a CES function of the relative proportions of both inputs employed:

$$CAP_i / LAN_i = \left(PK_i / PL_i \right)^{1/rhok_i + 1} \left(shlcala_i / 1 - shcala_i \right)^{1/rhok_i + 1} \qquad (33)$$

xi. A composite CES demand function for all four input subtypes (skilled labour, unskilled labour, capital and land) was derived as:

$$LABSU_i / CALA_i = \left(PW12_i / PKL_i \right)^{1/rholk_i + 1} \left(shlsucl_i / 1 - shlsucl_i \right)^{1/rholk_i + 1} \qquad (34)$$

xii. The total output by exporting sectors was computed as the sum of goods produced for export and those sold in the domestic market:

$$X_{ie} = at_{ie}\beta_{ie}E_{ie}^{\ rhot_{ie}} + (1-\beta_{ie})D_{ie}^{\ rhot_{ie}^{\left(\frac{1}{rhot_{ie}}\right)}} \quad (35)$$

xiii. The total production in the non-exporting sectors equals their domestic supply:

$$X_{ien} = D_{ien} \quad (36)$$

xiv. The export of goods produced by each sector was derived as a function of the domestic demand, domestic price and export price of the good:

$$\frac{E_{ie}}{D_{ie}} = \left(\frac{PE_{ie}}{PD_{ie}}\right)\left(\frac{1-\beta_{ie}}{\beta_{ie}}\right)^{\left(\frac{1}{rhot_{ie}-1}\right)} \quad (37)$$

xv. The quantity of each sector's goods supplied to the domestic market was a composite function of the imported finished goods and the domestic supply by the sectors:

$$Q_{im} = ac_{im}\left(\delta_{im}M_{im}^{\ -rhoc_{im}} + (1-\delta_{im})D_{im}^{\ -rhoc_{im}}\right)^{-1/rhoc_{im}} \quad (38)$$

xvi. The composite final good for a non-importing sector equals the domestic supply of goods by that sector:

$$Q_{imn} = D_{imn} \quad (39)$$

xvii. The import of final good by each sector was conceived as a function of the domestic supply of the import alternative, the import price and the domestic price:

$$M_{im}/D_{im} = \left(PD_{im}/PM_{im}\right)^{\left(1/rhoc_{im}+1\right)}\left(\delta_{im}/1-\delta_{im}\right)^{\left(1/rhoc_{im}+1\right)} \quad (40)$$

c. **Demand and Income Block**

There are 16 equations in the demand and income block. They are explained in the following sections.

xviii. Capital income (gross) was defined as the sum over sectors of capital demanded multiplied by the price of capital in each sector. Capital was modeled as immobile across sectors:

$$CAPY = \sum CAP_i PK_i \quad (41)$$

xix. Land was modeled as mobile across sectors. Land income was computed as the sum of land demanded by each sector multiplied by the price of land in the sector:

$$LANY = \sum LAN_i PL_i \tag{42}$$

xx. Both skilled and unskilled labour were modeled to be immobile across sectors. However, the substitutability of labour was subject to the CES function exponent (elasticity of substitution) between both labour types. Total skilled labour income was derived as the sum of skilled labour demanded by each sector multiplied by the wage rate or price of skilled in the sector:

$$LABYS = \sum LABS_i PW1 \tag{43}$$

xxi. Total unskilled labour income was derived as the sum of unskilled labour demanded by each sector multiplied by the wage rate or price of unskilled in the sector:

$$LABYU = \sum LABU_i PW2 \tag{44}$$

xxii. Net capital income was conceived as the sum of capital income of each sector multiplied by the price of capital in that sector corrected for depreciation:

$$NCAPY = \sum CAP_i PK_i \left(1 - depr_i\right) \tag{45}$$

xxiii. The total household income was derived as the sum of skilled labour, unskilled labour, capital and land incomes earned by each household from each sector:

$$HHY_h = \sum HFYLS_{hi}\left(LABS_i \cdot PW1\right) + \sum HFYLU_{hi}\left(LABU_i \cdot PW2\right) + \sum HFYK_{hi}\left(CAP_i \cdot PK_i\right)\left(1 - depr_i\right) + \sum HFYL_{hi}\left(LAN_i \cdot PL_i\right) \tag{46}$$

xxiv. Intermediate input supply was computed as the sum across sectors of the product of domestic output and the input-output coefficient:

$$INT_j = \sum IO_{ij} X_i \tag{47}$$

xxv. The intermediate input supply imported by each sector was derived as the share of intermediate input in each sector's domestic output:

$$N_{in} = nx_{in} X_{in} \tag{48}$$

xxvi. Intermediate input demand was obtained as the sum of intermediate input purchases by a sector from other sectors:

$$INTD_i = \sum IO_{ij} X_j \quad (49)$$

xxvii. Government subsidy to the sectors was derived as the sum across sectors of each sector's share of government subsidy multiplied by the value of that sector's output:

$$GOVSUB = \sum sub_i . PX_i X_i \quad (50)$$

xxviii. Indirect tax received by the government was computed as the sum across sectors of the indirect taxes paid by each sector:

$$INDTAX = \sum td_i PX_i X_i \quad (51)$$

xxix. The total import taxes obtained by the government was computed as the sum of the import taxes on both intermediate and finished goods:

$$IMTAX = \sum tm_{im} . PWM_{im} . ER + \sum tn_{in} PWN_n . N_{in} \quad (52)$$

xxx. Total government revenue was obtained as the sum of import duties and indirect taxes obtained by government from the sectors less the subsidy paid to the sectors:

$$GRTOT = IMTAX + INDTAX - GOVSUB \quad (53)$$

xxxi. Total government expenditure was derived as the sum across sectors of the government total revenue multiplied by each sector's share of government sectoral consumption:

$$GETOT = \sum g \sec_i \cdot GRTOT \quad (54)$$

xxxii. The composite commodity consumed by the households was derived as the product of the household's expenditure share and the total household income divided by the composite price:

$$HEXPQ = \frac{h \exp s_{hi} . HHY}{P_i} \quad (55)$$

xxxiii. The total private consumption by households on a sector was conceived as the sum of the composite commodity consumed by the households from that sector:

$$CD_i = \sum HEXPQ_{hi} \quad (56)$$

d. **Utility Block**

xxxiv. The 12 households in the model each maximise a Cobb-Douglas utility function subject to their consumer budget as follows:

$$HHU = \sum h \exp s_{hi} \log HEXPQ_{hi} \quad (57)$$

e. **Savings and Investment Block**

There are 8 equations in the savings and investment block. They are as follows:

xxxv. The savings of each household was derived as the difference between the total income of that household and the sum over sectors of its consumption of composite commodity:

$$SAV_h = HHY_h - \sum HEXPQ_{hi} \quad (58)$$

xxxvi. The total household savings was computed as the sum of savings by all households thus:

$$HSAV = \sum SAV_h \quad (59)$$

xxxvii. The depreciation on fixed capital equipment used by the firms amounts to their savings. This was computed as the sum of depreciation in the sectors:

$$DEPTOT = \sum depr_i \cdot CAP_i \cdot PK_i \quad (60)$$

xxxviii. Foreign savings was computed as the expenditure on final goods plus the expenditure on intermediate goods less the revenue from exports:

$$FSAV = \sum PWM_{im} M_{im} + \sum PWN_{in} . N_{in} - \sum PWE_{ie} . E_{ie} \quad (61)$$

xxxix. Government savings was derived as government total revenue less government total expenditure:

$$GOVSAV = GRTOT - GETOT \quad (62)$$

xl. The total savings in the economy was computed as the sum of foreign savings, total household savings, government savings and savings by the firms:

$$SAVINGS = FSAV \cdot ER + HSAV + GOVSAV + DEPTOT \quad (63)$$

xli. Savings in the economy equals investment:

$$INVEST = SAVINGS \quad (64)$$

xlii. Investment demand in the economy is satisfied by savings from all the sectors:

$$ID_i = ksh_i \cdot INVEST / P_i \quad (65)$$

f. **Market Clearing and Factor Market Equilibrium**

xliii. The neoclassical market clearing assumption in which the total demand for goods equals their composite supply was adopted:

$$Q_i = INTD_i + CD_i + GEXP_i + ID_i \quad (66)$$

Factor market equilibrium was attained under the following conditions (67 – 70):

xliv. Skilled labour demand equals its total supply:

$$LS = \sum LABS_i \quad (67)$$

xlv. Unskilled labour demanded equals its total supply:

$$LU = \sum LABU_i \quad (68)$$

xlvi. Capital demanded equals its total supply:

$$K = \sum CAP_i \quad (69)$$

xlvii. Land demanded equals its total supply:

$$L = \sum LAN_i \quad (70)$$

xlviii. In the objective function, gross domestic product (GDP) was given as the sum of all the production in the economy and the taxes collected:

$$GDP = \sum PV_i . X_i + IMTAX + INDTAX \quad (71)$$

xlix. Further, the real gross domestic product (RGDP) was derived as the sum of the private consumption, investment demand, government sectoral expenditure and exports less import of final and intermediate goods:

$$RGDP = \sum CD_i + \sum ID_i + \sum GEXP_i + \sum E_{ie} - \sum M_{im} - \sum N_{in} \quad (72)$$

3.3.6.3 **Description of Simulation Experiments**

Three policy scenarios were simulated in this study including increases in minimum wage by 12%, 30% and 67%. The wage simulation experiments were based on minimum wage policies from 1972 till date that have been used in Nigeria as well as those that are currently being

agitated for by labour unions. These were captured by increases in the minimum wage of the unskilled work force (PW2) by 12%, 30% and 67% respectively to mirror the various increases in the minimum wage of workers in Nigeria in the different socio-political regimes the nation has had. The effects of the minimum wage simulations on the key variables in the economy such as GDP, savings, household utility among others, were obtained by comparing the base-run information with the post-simulation figures. The three policy scenarios are explained in the following sections.

i. **Increases in Minimum Wage by 12% and 30%**

Increases in the wages of public sector workers in Nigeria occurred between 1972 and 1974 based on the recommendations of the Udoji commission. The outcome was wage increases of between 12% and 30% in the economy. These scenarios were simulated by initially setting the value of the exogenous unskilled labour wage (PW2) at 1 and then obtaining the base run model. Subsequently, PW2 was fixed at 1.12 and 1.30 respectively; the solutions were then obtained and compared with the base run values.

ii. **An Increase in Minimum Wage by 67%**

The current minimum wage level in the Nigerian economy is ₦18,000. However, the labour unions as well as some policy stake holders are of the opinion that that wage level does not match the current economic realities in the country due to the significant devaluation of the Naira. There is agitation, therefore, that the minimum wage in Nigeria should be increased to ₦30,000 (The Vanguard newspaper online, October 22, 2018). If implemented, this would represent a 67% increase in the minimum wage. This projected increase was simulated by adding 67% to the base run wage value of 1 and the model was re-run to determine the effect of the shock.

3.4 Limitations of the Study

There were a number of challenges encountered in carrying out this study. The major ones include data availability and accuracy as well as analytical demands which are described as follows:

i. **Data Availability and Accuracy:** The GHS (2010/11) data used for categorizing households into different welfare strata lacked accuracy as it had a lot of missing and outlying data and required a great deal of "cleaning" in order to reflect a true picture of the economic status of Nigerian households. It was also very challenging to obtain data on skilled/unskilled labour force distribution in Nigeria. Therefore, information from published researches relating to skill sets of Nigeria's labour force by sector were relied upon. Similar challenges were encountered in attempting to separate household land income from capital income. Furthermore, the GHS is largely an agricultural data set, so the study mainly captured the effect of informal labour market participation with respect to the agricultural sector.

ii. **Analytical Demands:** It was not possible to incorporate other forms of tariffs into the model apart from indirect and import taxes. This was due to limitations of time and data. Also labour market imperfections such as job-skill mismatch and crowding out were too analytically exacting to be introduced directly into the model. However, the effects of such phenomena were largely captured by introducing labour mobility between skilled and unskilled jobs as well as across rural and urban sectors. Moreover, the study was only able to simulate a static Nigerian economy.

Table 4: Analysis of Objectives

S/N	OBJECTIVE	MEANING	DATA REQUIRED	METHODOLOGY
1	To profile the rural labour market in Nigeria in terms of arrangements, participation, and wages.	To provide a detailed description of the activities and performance of rural households in the labour market. Wages will be analyzed in terms of proportion, gender dimension and inequality.	Labour market participation decision of households, gender dimensions to labour use, farm and off-farm wages (2011/2013 General Household Survey (GHS) data)	Descriptive statistics (and cross tabulations); Gini coefficient
2	To examine the effect of labour market participation on rural household welfare.	To examine the causal relationship between labour market participation and household welfare.	Labour market participation decision of households, welfare status (2011/2013 General Household Survey (GHS) data)	Fuzzy Sets; Heckman model/Ordered Probit model
3	To determine the effects of changes in domestic labour market policy on the rural economy.	To determine the effects of different labour market wage policy scenarios on the rural economy.	2011 Social Accounting Matrix (SAM) drawn from the 2011 Input-Output (I-O) table for Nigeria	Computable General Equilibrium (CGE) modeling
4	To examine the effects of changes in domestic labour market policy on rural household welfare.	To reveal the effects of labour market wage policy changes on the welfare of rural households.	2011 Social Accounting Matrix (SAM) drawn from the 2011 Input-Output (I-O) table for Nigeria	Computable General Equilibrium (CGE) modeling

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION OF RESULTS

This section is divided into 4 sections. Section 4.1 discusses the descriptive analysis of the socioeconomic characteristics of rural households in Nigeria while 4.2 presents their labour market participation decision and activities, wages and inequalities. In subsection 4.3 the explication is on the outcome of the multidimensional welfare analysis of households while 4.4 holds the result of the ordered probit model used to establish the relationship between the labour market participation decision of household heads and their household welfare. Finally, subsection 4.5 discusses the outcomes of the CGE simulations showing the effects of labour market policy on rural household welfare in Nigeria.

4.1 Socioeconomic Characteristics of Rural Households in Nigeria

The socioeconomic characteristics of the household heads and their households are presented in Table 6. The table shows a mean age of 49.96 (±15.53) years, indicating that an average household head was about 50 years of age and within the economically active years. Moreover, it was observed that 56% of the household heads were 50 years old or younger. Notwithstanding, a considerable proportion of these household heads (44%) were also above the 50 years mean age mark. It was also observed that household heads who were 30 years old and below were in the minority (10.8%) in the sample. Also, female household heads, on the average, were older (57 years) than their male counterparts (48 years).

Most of the household heads were male (81%), while only 2.4% of them had never obtained any form of formal education. However, educational attainment is still quite low in rural Nigeria as 91.5% of the household heads did not have tertiary education. This indicates that there is relatively poor educational attainment in rural Nigeria and this has negative implications for household welfare and economic development of the rural sector (Ogujiuba and Adeniyi, 2008).

Majority of the household heads (75%) were married with moderately large household sizes (average 6.25±3.33). More than half of the sample (55.1%) had between 6 and 15 household members.

Table 6: Distribution of Household Heads by Socioeconomic Characteristics

Characteristic	Male Headed Households (n=1,069) %	Female Headed Households (n=250) %	All (n=1,319) %	Difference Test (P-values)
Age				
≤ 30	9.8	1.0	10.8	
31 – 50	40.0	5.2	45.2	
>50	31.3	12.7	44.0	
Mean	48.32 (±15.11)	56.99 (±15.35)	49.96 (±15.53)	0.000***
Education				
No formal	2.0	0.4	2.4	
Vocational/technical	0.7	0.3	1.0	
Quranic	3.0	0.9	3.9	
Primary	38.3	7.8	46.1	
Secondary	29.6	8.5	38.1	
Tertiary	7.4	1.1	8.5	
Marital Status				
Married	73.5	1.4	75.0	
Single	7.5	17.5	25.0	
Household Size				
1 – 5	35.1	8.7	43.8	
6 – 15	45.2	9.9	55.1	
> 15	0.8	0.3	1.0	
Mean	6.34 (±3.34)	5.84 (±3.25)	6.25 (±3.33)	0.014*
Social Group Membership				
Not involved in social groups	63.7	15.5	79.2	
Involved in social groups	17.4	3.5	20.8	
Cooperatives	16.4	4.0	20.4	
Informal savings groups	12.4	67.3	79.6	
Household Monthly Income (₦)				
≤ 10, 000	50.0	10.8	60.8	
10, 001 – 30, 000	20.3	5.0	25.3	
30, 001 – 50, 000	5.2	1.2	5.8	
< 50, 000	5.6	1.9	7.5	
Mean	16,451.89 (±28,430.82)	19,661.10 (±30,998.37)	17,060.16 (±28,950.10)	0.068*
Credit Access				
No	62.2	15.1	77.3	
Yes	18.9	3.9	22.7	
Formal institutions	8.0	3.3	11.3	
Informal groups	42.0	8.3	50.3	
Friends and relatives	59.0	10.0	69.0	
Land Ownership				
No	60.3	13.5	73.8	
Yes	20.7	5.5	26.2	

*Note: Figures in bracket are standard deviations. Difference of means test was based on the Student's t-test where: *** significant at 1%; ** significant at 5%; * significant at 10%*

Also, a vast majority (73.8%) of the household heads did not own the land they used for agricultural and other activities. Often rural households relied on rented or leased plots for their livelihoods while some others worked on plots owned, leased or rented by others in the community. This corroborates the findings of Sitienei *et al*., (2013).

Social group membership was observed to be very low among the sampled household heads as almost 80% of them did not belong to any social groups. Furthermore, among those that belonged to social groups, only 4.2% belonged to formal cooperatives while the remaining 16.6% belonged to informal savings groups such as *adashi*, *esusu* and *ajo*. Yusuf (2008) showed that social capital formation has a positive effect on household welfare. Thus, most rural households in Nigeria seem to be missing out on the benefits of group formation. Moreover, male household heads who belonged to social groups were far more than their female counterparts as over 83% of those that belonged to such groups were male (making up 17.4% of the total sample). Income was low among the households with an average income of ₦17,060.16. Credit access is very low in rural Nigeria as only 22.7% of the household heads had access to credit. Among the male household heads, only 23.3% had access to credit while 20.4% of their female counterpart had access. Furthermore, the breakdown shows that informal sources of credit (informal groups, friends and relatives) were preferred by household heads though some of them used more than one credit source. Overall, friends and relatives were the mostly preferred source of credit as over 15% of the sample households obtained credit from these sources while just over 2% obtained credit from formal institutions.

In summary, household heads in rural Nigeria were mostly males within their economically active years. Most of them attained at least primary education, with only very few who had no formal education at all. However, only a small proportion had acquired tertiary education. Households were also moderately large. Only very few heads had access to credit, mostly from informal sources. Most rural households do not own land for their production activities. Social group formation is also very low as majority of the households did not belong to any social groups. Incomes were low, and the average income was below the current national minimum wage in Nigeria of ₦18,000.

4.2 Labour Activities, Participation and Use in Rural Nigeria

This section discusses the labour market participation decision of household heads, labour market activities and income. The gender dimensions to labour market activities, wages and wage inequality in rural Nigeria were also discussed.

4.2.1 Assessment of Labour Activities Engaged in by Household Heads

Majority of the household heads in rural Nigeria engaged in a number of economic activities of which one was their primary means of income. Some household heads, however, reported no secondary activities. Table 7 shows the distribution of household heads by their primary and secondary activities. Agriculture remains the dominant activity in rural Nigeria as it was seen to be the primary activity of 57.6% of male household heads and 58% of their female counterparts. Other real sector activities such as manufacturing, building and construction employed 7.3% and 12.4% respectively of male and female household heads.

As regards secondary employment, over 40% of the household heads reported no secondary occupation. Among those that reported, however, agriculture was still the dominant activity with over 20% engaged in it. This was followed by wholesale and retail trade and transportation with 12.5% and 10.2% respectively of the respondents. Wholesale and retail trade was, however, the major secondary economic activity of female household heads as 51.6% of them were engaged in these activities as their secondary means of income.

4.2.2 Participatory Labour Market Decision Making by Household Heads

The decision of a household head to participate (or otherwise) in the rural labour market is predicated on several factors most of which were socio-economic in nature as shown in Table 8. Household heads that worked on a farm or enterprise owned or rented by a household member or worked for anyone else who was not a household member were deemed to have participated in the labour market while those who did not engage in any of these were considered not to have participated in the labour market. Among the household heads, only about 34% participated in the labour market.

Table 8 shows that the bulk of rural labour market participants came from those in their economically active years. Household heads under 50 years of age made up 56.4% of the participants, while participating household heads within this age bracket constituted 19.4%. Furthermore, among the non-participants, the greatest proportion (44.2%) came from household heads above 50 years of age (making up 29% of the overall sample). The immediate foregoning confirms that with advancing age, people tend to become less productive and, consequently, less willing to supply their labour to the market. The gender distribution of participants and non-participants revealed that 35.5% of male household heads participated in the rural labour market as against 29.2% of their female counterparts.

Furthermore, most of the participating household heads (83.6%) had either primary or secondary education as highest educational attainment. Only 9% had tertiary education. This situation is understandable given that Table 7 earlier revealed that the agricultural sector was the main employer of labour in rural Nigeria. Thus, as Fields (2004) and Todaro (1970) explain, given the unspecialized nature of labour requirement (and employment) in the sector, it was expected that the bulk of its work force will have relatively low educational attainment. Table 9 reveals the labour input of respondents in seasonal man-hours. An average of 39.4 man hours of work was put in by the respondents. Male respondents on the average spent 2.9 hours more than their female counterparts in their labour activities.

4.2.3 **Assessment of Gender Dimensions to Labour Use, Activities and Wages**

Agriculture is the dominant economic activity in rural Nigeria. Table 10 provides a profile of the gender dimensions to agricultural labour use, activities and wages in Nigeria delineated by geopolitical zones (GPZ). It was observed that land clearing and preparation was a male dominated activity in all six GPZs. The overwhelming majority of villages indicated that men were mostly hired for such activities. Similarly, men were mostly hired for planting activity. Fertilizer application was also a largely male dominated activity except for the south-east and south-south GPZs, where it was found that more women were hired for the activity. Similarly, in the South-East and South-South GPZs, more women were employed for weeding activity compared with the other four GPZs, where men were often preferably employed.

Table 7: Distribution of Household Heads by Primary and Secondary Labour Activities

Sector of Employment	Primary Activity			Secondary Activity		
	Male % (n = 1, 069)	Female % (n = 250)	All % (n = 1, 319)	Male % (n = 1, 069)	Female % (n = 250)	All % (n = 1, 319)
Administration	4.7	1.4	6.1	3.1	0.3	3.4
Agriculture & forestry	46.7	11	57.7	17.0	3.9	20.9
Artisanship	0.2	0.1	0.3	-	-	-
Building & construction	1.8	0.5	2.3	1.5	0.5	2.0
Education	2.7	0.8	3.5	2.0	0.2	2.3
Finance	0.2	0.2	0.4	-	-	-
Health	1	0.2	1.1	-	-	-
Manufacturing	4.1	1.9	6.0	6.2	1.6	7.8
Sales (wholesale & retail)	15.4	2.7	18.1	2.7	9.8	12.5
Security	0.1	0.7	0.8	-	-	-
Social work and remediation	0.2	0.1	0.2	-	-	-
Specialized services	1.2	0.1	1.3	-	-	-
Transportation	2.1	0.1	2.2	8.3	2.0	10.2
Unreported	-	-	-	7.7	33.1	40.8

Table 8: Distribution of Labour Market Participation Decision by Characteristics of Household Heads

Characteristics	Participation Decision	
	Yes (n = 452)	No (n = 867)
	%	%
All	34.3	65.7
Age		
≤ 30	3.4	7.4
31 – 50	15.9	29.3
> 50	14.9	29.1
Sex		
Male	28.7	52.3
Female	5.5	13.4
Educational Attainment		
No formal	0.6	1.8
Vocational/technical	0.5	0.5
Quranic	1.4	2.5
Primary	16.5	29.6
Secondary	12.2	25.9
Tertiary	3.1	5.4

Table 9: Distribution of Labour Input in Seasonal Man-Hours by Sex of Participating Household Heads

Man-hours per month	Male (n = 379) %	Female (n = 73) %	All (n = 452) %	Difference Test (P-values)
≤20	5.1	1.5	6.6	
21 – 40	50.0	10.8	60.8	
41 – 60	26.3	3.5	29.9	
>60	2.4	0.2	2.7	
Mean	39.9 (±11.7)	37.0 (±11.9)	39.4 (±11.8)	**0.005

*Note: Figures in bracket are standard deviations. Difference of means test was based on the Student's t-test where: ***. significant at 1%; ** significant at 5%; * . significant at 10%*

With regard to sourcing of labour, Table 10 shows that all GPZs had labour mostly sourced from both within and outside the villages except the north-west where labour was largely sought from within respective villages. For wages, overall, men earned more than women and children for most activities while children earned the least. The profile of wage inequality in rural areas across GPZs by gender is presented in Table 11. It reveals that wage inequality is low in rural Nigeria with a Gini coefficient of 0.38. However, disaggregating by GPZs, wage inequality was found to be highest in the North-Central zone (0.37) and lowest in the South-Eastern zone (0.25). Wages earned by men showed the least inequality (0.34) while those of children showed the highest inequality (0.36).

In summary, the results show that agriculture is the dominant economic activity in the rural parts of Nigeria. It was found that labour market participation is low, with the bulk of participants falling among the economically active, male members of the rural sector. Most of the participants had either primary or secondary education as their highest educational attainment. Male household heads in rural Nigeria also had greater labour input than their female counterparts as labour for major agricultural production activities was mostly supplied by male folk in all the GPZs of rural Nigeria. Further, males in rural Nigeria earned the highest wages while children were the least remunerated. Income inequality is low throughout the rural areas and lowest among male folk. Income of children showed the highest inequality.

4.3 **Assessment of Rural Households' Welfare**

The outcome of the welfare analysis of rural households is presented in this section which is subdivided into two. The first evaluates the welfare situation in rural Nigeria and the second shows a breakdown of the welfare status of households based on selected socioeconomic attributes.

Table 10: Gender Dimensions to Agricultural Labour Use, Activities and Wages in Rural Nigeria

Geopolitical Zone (GPZ)	Labour Activities	*Gender of Labour Hired %			**Source of Labour %			Average Daily Wages in ₦		
		Men	Women	Children	Within	Outside	Both	Men	Women	Children
North-West	Clearing/preparing fields	85.7	7.14	37.1	54.3	1.4	28.6	484.17	282.00	236.54
	First planting	95.7	40.0	62.9	57.1	4.3	32.9	443.94	312.86	220.91
	Second planting	85.7	32.9	54.3	47.1	1.4	35.7	442.37	315.65	232.89
	Third planting	84.3	31.4	52.9	44.3	2.9	35.7	506.90	342.73	260.81
	Applying fertilizer	52.9	10.0	34.3	40.0	0.0	15.7	352.70	251.43	207.08
	Weeding	84.3	15.7	48.6	48.6	2.9	31.4	555.08	378.18	269.12
North-Central	Clearing/preparing fields	84.3	41.2	35.3	25.5	3.9	56.9	826.74	433.33	701.39
	First planting	72.5	51.0	27.5	37.25	3.9	41.1	643.24	440.00	255.71
	Second planting	60.0	60.0	28.0	32.0	4.0	40.0	653.33	436.21	282.14
	Third planting	60.0	54.0	22.0	30.0	4.0	40.0	633.33	565.38	281.82
	Applying fertilizer	38.0	32.0	28.0	8.0	2.0	32.0	476.32	363.33	257.14
	Weeding	82.0	54.0	40.0	30	4.0	54.0	975.61	444.23	440.00
North-East	Clearing/preparing fields	65.2	34.8	50.0	28.8	3.0	43.9	692.86	682.61	389.39
	First planting	81.8	43.9	54.5	19.7	4.5	57.6	582.41	558.62	338.89
	Second planting	78.8	42.4	54.5	19.7	1.5	57.6	570.19	532.14	331.94
	Third planting	72.7	39.4	51.5	21.2	1.5	50	558.33	555.77	317.65
	Applying fertilizer	33.3	25.8	28.8	7.6	1.5	24.2	497.73	458.82	298.42
	Weeding	87.9	36.4	54.5	21.2	1.5	65.2	809.48	629.17	447.22
South-West	Clearing/preparing fields	84.0	8.0	8.0	32.0	40.0	12.0	990.48	750.00	800.00
	First planting	76.0	20.0	12.0	32.0	36.0	8.0	900.00	760.00	466.67
	Second planting	72.0	24.0	16.0	32.0	36.0	8.0	844.44	766.67	450.00
	Third planting	68.0	20.0	12.0	28.0	36.0	4.0	888.24	820.00	433.33
	Applying fertilizer	32.0	8.0	4.0	24.0	12.0	0.0	1,125.00	750.00	500.00
	Weeding	76.0	12.0	16.0	36.0	40.0	4.0	931.58	833.33	466.67
South-South	Clearing/preparing fields	86.8	32.1	22.6	32.1	3.8	50.9	1,191.30	1,305.88	687.50
	First planting	66.0	64.2	18.9	26.4	1.9	49.1	1,501.47	1,040.91	750.00
	Second planting	52.8	41.5	18.9	24.5	1.9	35.8	1,066.67	885.71	670.00
	Third planting	24.5	39.6	15.1	26.4	1.9	18.9	1,169.23	900.00	656.25
	Applying fertilizer	3.8	7.5	1.9	5.7	0.0	3.8	600.00	833.33	700.00
	Weeding	37.7	77.4	15.1	34.0	1.9	45.3	1,394.74	905.00	606.25
South-East	Clearing/preparing fields	79.7	61.0	11.9	25.4	3.4	50.8	1,235.11	869.44	500.00
	First planting	88.1	86.4	16.9	28.8	1.7	67.8	1,218.27	996.08	530.00
	Second planting	86.4	89.8	15.3	28.8	3.4	67.8	1,238.24	1,022.64	600.00
	Third planting	83.1	91.5	11.9	27.1	3.4	66.1	1,203.06	972.22	485.71
	Applying fertilizer	15.3	22.0	3.4	1.7	3.4	22.0	855.56	734.62	550.00
	Weeding	20.3	54.2	6.8	3.4	3.4	47.5	1,050.00	1,009.38	525.00

Note:

**Represents the proportion of local government areas in each GPZ where each gender is reported to have been hired for respective activities.*

*** Represents the proportion of local government areas in each GPZ for the types of labour sources.*

Table 11: Distribution of Wage Inequality in Rural Nigeria by Gender and Geopolitical Zone

Zone	*Wage Inequality			
	Overall	**Men**	**Women**	**Children**
Rural Nigeria	0.38	0.34	0.35	0.36
North-West	0.32	0.26	0.30	0.27
North-Central	0.37	0.32	0.29	0.45
North-East	0.32	0.27	0.31	0.30
South-West	0.26	0.25	0.15	0.28
South-South	0.29	0.29	0.27	0.22
South-East	0.25	0.21	0.25	0.22

Note:

* The figures for wage inequality are the Ginni coefficients.

4.3.1 **Evaluation of Rural Households' Welfare Status**

The welfare status of the households was assessed using the fuzzy sets approach. As discussed in chapter 3, this method involves the use of assets owned by the households, along with other non-monetary indicators, as measures of welfare. Table 12 shows a distribution of asset ownership among the households. Based on the fuzzy approach, a household that is not deprived in any of the dimensions (for example, assets, food availability among others) will have a welfare index of 1(the best possible scenario) while one that is deprived in all dimensions will have an index of 0 (the worst possible scenario). The overall mean welfare index (MWI) of the rural households was 0.12. This signifies a poor welfare scenario in rural Nigeria brought about by low asset ownership. The MWI was also used to measure the depth of deprivation experienced by the households. The lower the index, the more deprived the households were. Thus, the result obtained for the MWI (0.12) is indeed evidence that rural households in Nigeria were deprived. Figure 10 summarizes the household welfare indices.

Furthermore, households with MWI greater than or equal to one-third of the overall MWI but less than two-third were regarded as having low welfare. Those with MWI greater than or equal to two-thirds of the overall MWI but less than the overall MWI were categorized as having medium welfare whereas those with MWI greater than or equal to the overall MWI were considered to be households with high welfare.

4.3.2 **Welfare Decomposition by Household Socioeconomic Characteristics**

The welfare indices and poverty incidences of the households were decomposed by socioeconomic characteristics. The results are presented in Table 13. The overall MWI of rural households was 0.12, indicating a poor welfare situation throughout the rural sector in Nigeria. The results indicated that MWI was uniform (at 0.12) among almost all categories of rural households. The best MWI of 0.13 was observed among households whose heads participated in the labour market.

4.4 **Effect of Labour Market Participation on Welfare of Rural Households**

To assess the effect of labour market participation on rural household welfare, a regression analysis was carried out. Having fitted a Heckman model on the data and obtaining a statistically

insignificant Inverse Mills ratio (see Table 14) indicating the absence of any bias, the ordered probit model was then used to carry out an assessment of the effect of labour market participation decision of household heads on the welfare. Table 15 presents the results of the ordered probit analysis. The chi-square value of 24.6 was seen to be statistically significant at 1% level, indicating that the data set fitted the model. Although the R^2 value was low, going by Frost (2014), the low R^2 value was not sufficient to query the goodness of fit of the model since such low values can be expected in social science research because human behaviour is often largely unpredictable. Furthermore, R^2 is not a test statistic and there seems to be no clear intuitive justification for its use as such (Cameron, 1993) particularly in non-linear regression models. The probabilities of the ordered dependent variable Y taking values of 0, 1 or 2 lay between probabilities of -0.111 and 1.061 of the standardized normal variable z. These probabilities represent the cut-off points or threshold parameters of the model. Five of the exogenous variables were seen to be statistically significant at different levels ranging from 5% to 10%. The implications are discussed as follows.

The coefficient of labour market participation (LMP), though significant at 5%, has a negative sign. The implication of this is that LMP by a household head reduced the household's probability for improved (high) welfare by 0.164. Similarly, the probability that a household would have moderate welfare is reduced by 0.043 if the household head participates in the labour market. This shows a similar outcome of LMP in rural Nigeria to what Sitienei et al., (2013) found in Malawi. Therefore, the low and unregulated incomes earned by rural sector workers were seen to be negatively affecting their household welfare. It was also found that being a household headed by a female, increased the probability that household welfare would be raised by 0.054 (significant at 10%). This can be traced to the significant role of mothers in ensuring the adequate nutrition and general wellbeing of their households as opined by Black et al., (2013). On the other hand, being unmarried reduced that probability by 0.047 (significant at 5%), indicating that a household head's being married would improve the welfare situation of the household. This can be explained by the fact that single parent homes tend to be more vulnerable to poverty (Porterfield, 2001). Conversely, where the household head is married, there would usually be income from at least two sources, thereby ensuring more income than in a single-headed household, making that household better-off.

It was also found that a unit increase in the size of the farmland held by the household would result in a 0.02% decrease in the probability that a household would belong to the high welfare category (at 5% significance), likely an indication of the greatly reduced productivity that results from neglect of farms by owners in preference for supply of labour to other farms and activities (Sitienei et al., 2013). Thus, the poor wages they receive, coupled with the loss of potential income from their neglected farms leaves rural household heads in a poverty trap. This situation is worsened by the possibility that they could be paying some form of rent on their land holdings as majority do not own the lands they use for production as revealed in table 6.

In summary, the welfare situation in rural Nigeria is very poor due to low income which results in low asset ownership. The low wage inequality in the rural sector further suggests that the low welfare is rather evenly spread among rural households. Smaller households were found to be better off than larger ones while those whose household heads participated in the labour market tended to show a slightly better welfare situation than those who did not participate. The regression result, however, showed that participating in the labour market, as well as farm size, diminished the probability that the households would be well-off.

Table 12: Distribution of Assets Ownership among Rural Households in Nigeria

Assets	Percentage of Households Owning Assets (n = 1,319)
Household Assets	
Furniture	87.8
Mattress	90.9
Bed	83.9
Mat	81.9
Sewing machine	9.9
Gas cooker	1.7
Stove	29.6
Fridge	9.0
Freezer	4.3
Air conditioner	0.8
Washing machine	0.0
Electric clothes dryer	0.0
Bicycle	27.7
Motorbike	37.7
Cars and other vehicles	4.9
Generator	19.8
Fan	27.1
Radio	60.6
Cassette recorder	11.1
Hi-Fi (Sound System)	2.6
Microwave	1.1
Iron	27.7
TV Set	28.5
Computer	1.8
DVD Player	22.0
Satellite Dish	2.4
Musical Instrument	0.0
Mobile Phone	59.2
Inverter	0.5
Agricultural Assets	
Land	20.9
Farm Machine	9.2
Others Assets	11.6

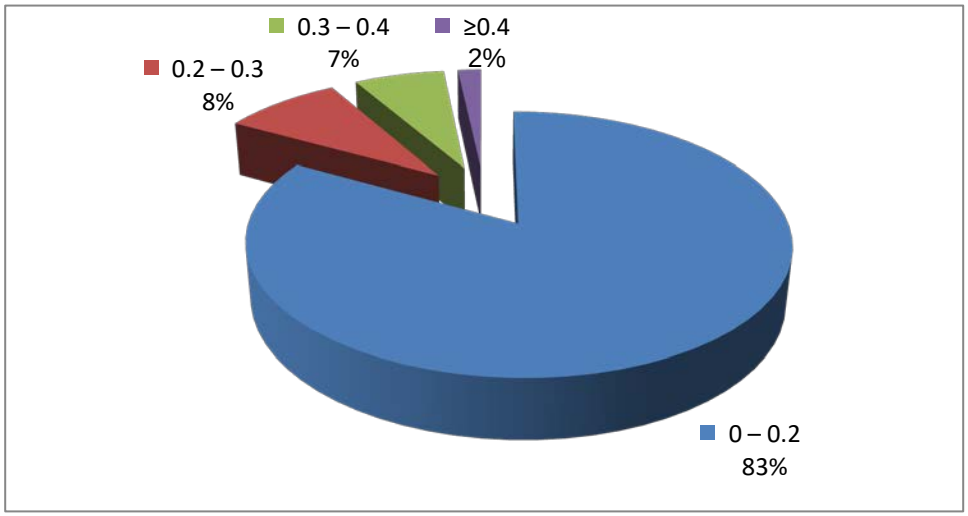


Figure 10: Summary of Welfare Status among Rural Households

Table 13: Welfare Distribution by Selected Household Characteristics

Socioeconomic Characteristics	MWI	Socioeconomic Characteristics	MWI
Age		**Household Size**	
≤ 30	0.12	1 - 5	0.12
31 – 50	0.12	6 – 15	0.12
> 50	0.12	> 15	0.13
Gender		**Land Ownership**	
Male	0.12	Owns Land	0.12
Female	0.12	Does not Own Land	0.12
Marital Status		**Social Group Membership**	
Married	0.12	Belongs	0.12
Single	0.12	Does not Belong	0.12
Credit Access			
Does not have access	0.12	Participates	0.13
Has access to credit	0.12	Does not participate	0.12

Table 14: Parameter Estimates of the Heckman Two-Stage Procedure for Testing for Selectivity Bias

	Variables	Coefficient	Standard error	t-ratio
Heckman stage II Welfare (DV)	Age	0.002	0.002	0.89
	Age^2	-0.000	0.000	-0.97
	Gender	-0.024	0.211	-0.11
	Marital status	0.010	0.025	0.40
	Household size	-0.000	0.043	-0.01
	Primary occupation in agric.	0.003	0.045	0.07
	Farm size	-0.004	0.020	-0.18
	Total income	-0.000	0.000	-0.02
	Social capital	-0.001	0.015	-0.07
	Credit access	0.009	0.013	0.73
	Monthly man-hours worked	0.000	0.000	0.06
	Constant	0.110	2.373	0.05
	Selection variables	**Coefficient**	**Standard error**	**t-ratio**
Heckman stage I Labour Market Participation (Selection DV)	Age	-0.001	0.013	-0.07
	Age^2	0.000	0.000	0.04
	Gender	0.164	0.096	1.71
	Marital status	-0.018	0.073	-0.25
	Household size	0.034	0.011	3.15
	Primary occupation in agric.	0.035	0.074	0.47
	Farm size	0.016	0.027	0.58
	Total income	0.000	0.000	1.34
	Social capital	0.004	0.104	0.04
	Credit access	-0.001	0.101	-0.01
	Constant	-0.775	0.365	-2.12
	Lambda (IMR)	-0.016	1.775	-0.01
	Rho	-0.161		
	Sigma	0.098		

DV = Dependent variable; IMR = Inverse Mills Ratio

Table 15: Parameter Estimates of the Determinants of Rural Household Welfare in Nigeria

Variables	Coefficient	Standard Error	t-Ratio	Slope		
				High Welfare	Moderate Welfare	Low Welfare
Labour market participation	-0.434**	0.191	-2.27	0.164	-0.043	-0.12
Age	0.007	0.011	0.65	-0.003	0.001	0.002
Age^2	-0.000	0.000	-0.52	0.000	-0.000	-0.000
Sex	0.141*	0.082	1.72	-0.054	0.014	0.040
Marital status	-0.122**	0.063	-1.94	0.047	-0.012	-0.034
Household size	0.011	0.009	1.17	-0.004	0.001	0.003
Monthly man-hours worked	0.007	0.005	1.53	-0.003	0.001	0.002
Farm size	-0.051**	0.023	-2.17	0.020	-0.005	-0.014
Total income	-0.000	0.000	-0.57	0.000	-0.000	-0.000
Social capital	-0.181**	0.091	-2.00	0.068	-0.018	-0.051
Credit access	0.086	0.088	0.98	-0.032	0.008	0.024
Log likelihood	-1,378.988					
Prob> chi^2	0.010					
chi^2	24.63***					
Pseudo R^2	0.009					
#α_1	-0.111					
#α_2	1.061					

******** *coeff. significant at 1%;* ******** *coeff. significant at 5%;* ******* *coeff. significant at 10%*

#Pr (Y = 0) = Pr (z < -0.111); Pr (Y = 1) = Pr (-0.111 < z < 1.061); Pr (Y = 2) = Pr (z > 1.061)

Note: Pr = Probability

4.5 CGE Simulation Analysis for the Nigerian Economy

The results of the CGE simulation analysis for the Nigerian economy based on the 2011 SAM data are presented in this section. The SAM data shows the circular flow of income within the economy for the year 2011. The base solution of the model replicated the SAM data, thereby allowing for simulations to be carried out to test the effects of different policy shocks. The following sections describe the base scenario for the economy in terms of sector, macroeconomic and household variables, while subsequent subsections show the results of simulation experiments carried out to show the effects of different minimum wage levels on the Nigerian economy and household welfare with particular interest in rural household outcomes.

4.5.1 Base Scenario of Sector Variables

Table 16 presents the base-run or "business-as-usual" scenario of the five (5) sectors in the study. It shows the initial values of the key sector variables. The variables are domestic output, composite, exports, imports (intermediate and final goods), labour (skilled and unskilled), capital and land. The sector variables are described as follows:

i. Domestic Output

The total output produced by each sector constituted its domestic output. This includes both the exported output and that which was sold locally. The total domestic output for the 5 sectors for the base year 2011 was ₦58,798.82 billion. The highest output produced domestically came from the utilities and services sector (33%), followed by the crude oil and mining sector (29%). The dominance of the utilities and services sectors was clearly the result of the huge influx of telecommunications investment in the country since 1999. The crop subsector also recorded an appreciable output (24%). This showed the importance of this subsector in the Nigerian economy as well as its great potential as a means of economic diversification from the oil sector. In contrast, other agricultural activities such a livestock production, fisheries and forestry were poor contributors to the Nigerian economy as they accounted for only 3% of total domestic output. This shows that a lot of effort would be required to grow these subsectors in order to boost the overall contribution of agriculture to domestic output. Manufacturing could also be improved through the provision of adequate infrastructure (power and roads) so as to increase its contribution to gross output from its current level of just 11%.

Table 16: SAM Base Scenario of Sector Variables in ₦'Billion

Variables	Sectors					
	CRP	**OAG**	**COM**	**MAN**	**UTS**	**Total**
Domestic output	13,834.13	2,008.44	17,083.73	6,351.53	19,521.00	58,798.82
	(23.53)	(3.42)	(29.05)	(10.80)	(33.20)	(100)
Composite	7,356.23	1,999.77	2,214.58	7,942.03	23,233.79	42,746.41
	(17.21)	(4.68)	(5.18)	(18.58)	(54.35)	(100)
Exports	6,683.89	108.08	14,986.11	79.46	116.63	21,974.17
	(30.42)	(0.49)	(68.20)	(0.36)	(0.53)	(100)
Imports						
Intermediate goods	98.15	0.07	262.54	109.93	193.86	664.56
	(14.77)	(0.01)	(39.51)	(16.54)	(29.17)	(100)
Final goods	195.66	92.53	111.55	1,555.06	3,660.74	5,615.55
	(3.48)	(1.65)	(1.99)	(27.69)	(65.19)	(100)
Skilled labour	1,116.02	85.67	3,250.20	9.78	1,240.93	5,702.59
	(19.57)	(1.50)	(57.00)	(0.17)	(21.76)	(100)
Unskilled labour	2,108.53	161.86	2,166.80	22.47	2,298.51	6,758.17
	(31.20)	(2.40)	(32.06)	(0.33)	(34.01)	(100)
Capital	2,816.29	350.39	7,965.47	57.47	4,843.59	16,033.21
	(17.57)	(2.19)	(49.68)	(0.36)	(30.21)	(100)
Land	4,161.17	232.73	1,976.17	20.39	1,575.07	7,965.53
	(52.24)	(2.92)	(24.81)	(0.26)	(19.77)	(100)

Note: Figures in parenthesis are percentages of the total accruing to each sector.
Source: CGE model base result output.

Sectors key:

CRP – Crop production subsector
OAG – Other agriculture subsector
COM – Crude oil and mining sector
MAN – Manufacturing sector
UTS – Utilities and services sector

ii. **Composite Commodity**

The composite commodity is the total quantity of goods available for consumption in an economy. It is made up of goods produced domestically and sold locally (i.e. domestic output less exports) and imported commodities. From Table 16 it is observed that the utilities and services sector had the highest proportion (54%) of the composite commodity in the economy. This suggests that the products of the sector were in very high demand. The crop subsector ranks third in the proportion of the composite (17%). This shows that crop products held a fairly large share of the market in Nigeria and if the current import substitution drive of the Nigerian government was sustained, a large part of the market share of crop output in the country could be satisfied by local production which could greatly improve the welfare of rural farmers, who were the major producers, through improved income.

iii. **Exports**

Domestic output of goods that are sold outside the shores of the country were referred to as exports. For the base year 2011, the crude oil and mining sector was, by far, the dominant exporting sector in Nigeria, accounting for 68% of exports. This dominance of crude oil exports has been the status quo for many years since the "oil boom" era as the sector received the greatest attention from the government and attracted huge foreign investments from large oil exploring corporations. It should, however, be noted that crop production also accounts for a significant proportion of exports from the country. Crop exports were valued at ₦6,683.89 billion, representing 30% of total exports for the base year. This performance far outweighed those of other agriculture, manufacturing and utilities and services sectors which jointly contributed only 1.38%. Despite the utilities sector having the highest share of domestic output, it had one of the lowest shares of export, indicating a lack of competitiveness of the sector. This means that the sector's output was almost entirely consumed domestically. Crop production, on the other hand, had great potentials for foreign exchange earnings.

iii. **Imports**

Goods produced outside the country were often purchased to bridge demand deficits created by weak domestic sectors as well as to satisfy the taste of local consumers for certain foreign goods. Also, certain inputs required for domestic production could only be sourced abroad. These

factors gave rise to the importation of goods, either intermediate or finished. A high level of importation could cause a strain on the nation's foreign reserves and worsen the exchange rate of the local currency. From the base year, the sector with highest value of importation of intermediate commodities (inputs) was the crude oil and mining sector. The sector spent ₦263 billion (39.5%) on importation of inputs. This was expected as the crude oil sector is a highly specialized sector requiring high-tech equipment which cannot be sourced in the country. Moreover, attempts at local crude oil exploration and refining were mostly rudimentary and often illegal in Nigeria. The crop subsector contributed 15% to the value of imports of intermediate goods. This came mostly from the importation of machinery, fertilizers and agrochemicals. On the other hand, the other agriculture sector imported the least value of intermediates at just ₦70 million (0.01%). This indicates that most of the equipment used in the sector were probably fabricated locally and their inputs were readily available within Nigeria.

As regards importation of final goods, manufactured commodities and utilities took the bulk (93%) of national expenditure for the base period with the remaining 3 sectors having a share of 7%. This was evident in the huge markets for imported industrial commodities all over the country. Crop product imports were relatively low (3%) as was the case with other agriculture imports (2%). These could be attributed to the efforts of the government aimed at protecting local producers through import tariffs or outright bans on the importation of competing goods. The importation of final goods by the crude oil and mining sector, amounted to ₦112billion, representing the cost of importation of refined petroleum products into the country which has been the practice for decades now because domestic refineries remain non-functional.

iv. **Labour**

Generally, labour refers to productive effort, physical and mental, owned by members of the workforce. As a factor of production, it is often seen as the human contribution to production. Labour was disaggregated according to skill in the SAM for this study. Skilled labour refers to that part of the workforce with high education or expertise which creates more economic value when employed. Skilled labour contributes to innovation and growth and is usually characterized by higher wages. Unskilled labour, on the other hand, is associated with lower educational attainment, minimal economic value, limited competence and lower wages. Following Oluyomi

(2015), the labour value in the SAM was separated into skilled and unskilled labour employment by sector. Going by the results in Table 16, the highest value of skilled labour was employed in the crude oil and mining sector with a share of 57% of the total value of labour employment in the base year. The least employer of skilled labour was the manufacturing sector with a share of just 0.17%. It can also be seen that 21% of the value of skilled labour was employed in agriculture, but the crop subsector holds 20% of the share going to agriculture. With reference to unskilled labour, the crop subsector, as well as the crude oil and utilities sectors all held over 30% each of the total value of employment. In total, the crude oil and mining sector had the highest value of labour employment at ₦5,417 billion, representing 43% of the overall value of employment. The crop subsector ranked third with a labour employment value of ₦3,225 billion, representing a share of 26%.

v. **Capital**

Capital is a factor of production which mainly refers to physical assets and equipment used in production. In the base year, the crude oil and mining sector were the most capital intensive, holding about 50% of capital employed. The utilities sector ranked second at 30%. Capital employment in the crop subsector was ₦2,816 billion while it was ₦162 billion in the other agriculture sector. With only about 20% of the total, it could be said that capital investment is relatively low in Nigerian agriculture. Therefore, more capital investment needs to be directed towards the sector if there is to be sustained growth and improved welfare of its actors.

vi. **Land**

Land is another factor of production. Its significance in each sector varies from the crop production sector, where it is indispensable for growing crops, to the manufacturing sector, where it is a far less significant factor of production. Based on this, it was not surprising that the crop production subsector held more than half (52%) of the total value of land used in production among all the sectors in the base year. The manufacturing sector invested the least in land with a value of just ₦20 billion, representing 0.3% of the total investment in land by the sectors. Investment in land by the other agriculture sector was relatively low at ₦233 billion representing a 3% share of total land investment.

vii. **Prices**

All prices in the base run were set at one (1) in order to be able to detect the net effects of changes in the key variable after carrying out simulation experiments. The SAM does not provide information on prices of goods. The prices used in the model include: prices of skilled and unskilled labour, the price of composite labour, the price of capital, the price of land, the price of composite capital and land, the price of composite commodity, the domestic price of export, the domestic price of import and the domestic price of intermediate import, among others.

4.5.2 Base Scenario of Macroeconomic Aggregates

This section shows the base run scenario of different important macroeconomic aggregates in the model. Table 17 gives a summary of these aggregates which are hereby discussed.

i. **Gross Domestic Product (GDP) and Real Gross Domestic Product (RGDP)**

The Gross Domestic Product (GDP) refers to the total value of goods and services produced in an economy for a particular year. In other words, it is the sum of the value-added output from each of the 5 sectors in the model and government taxes (indirect and import taxes). GDP is normally computed at current prices while the RGDP is corrected for inflation and computed at constant prices. The ratio of the nominal GDP to the RGDP is the GDP deflator which is an indicator of price changes within the economy in the base year. Going by Table 17, the GDP in the base run was ₦36,459.50 while the RGDP was ₦36,620.94. Thus the GDP deflator was approximately one (1). This indicates that there was a decrease in the average price of value added output in the base year. This situation might be explained by the fact that there was a 10.1% increase in output in the Nigerian economy between 2010 and 2011 (CBN, 2012) which could have forced down prices.

ii. **Government Revenue, Taxes and Subsidy Payments**

Government revenue in the model economy comes from import and indirect taxes less subsidy payments. This revenue is spent on government's consumption of the outputs of the 5 sectors. The total government revenue in the base year was ₦486 billion.

Import tax is a fixed percentage charged by the government on the value of all intermediate and final goods imported into the country. Import tax revenue in the base run was ₦324 billion, representing 65% of the total government revenue for that year. Clearly, import taxes were the chief source of revenue for the government in the base year 2011.

Indirect taxes, on the other hand, are levies imposed by the government on the consumption of goods and services within the economy. Indirect taxes are not charged *ad valorem*, as is the case with import taxes, but are paid as added costs of products consumed. Indirect tax was modeled as the sum of all taxes in the economy, apart from import tax. Indirect tax revenue in the base year was ₦177.3 billion, making up 35% of government revenue for the period. Subsidy payments to the sectors amounted to ₦15.9 billion, which was 3.2% of total government revenue.

iii. **Government Savings**

Government savings refers to the residue of government income after all expenditures have been incurred. The different motives for such saving include deflating the economy in order to curb inflationary trends or the possibility of financing future capital investments. Table 17 shows that government, in the model, ran a deficit of ₦2,173 billion. Rather than recording any savings, the government's expenditure was mostly financed by borrowing. Government borrowing amounted to 400% of its revenue. Deficit financing by government could have negative implications for the economy as significant proportions of future government revenues would have to be spent on debt servicing to the detriment of the economic sectors that could have received such amounts in the form of capital investments or subsidies. Clements et al., (2003) posited that this procedure could lead to reduced economic output, especially when such loans have been expended on recurrent expenditures rather than capital assets.

Table 17: SAM Base Scenario of Macroeconomic Aggregates in ₦ Billion

Variable	Aggregates (₦'billion)
Gross Domestic Product (GDP)	36,459.50
Real Gross Domestic Product (RGDP)	36,620.94
GDP deflator	0.996
Import tax	324.12
Indirect tax	177.30
Government subsidy payments	15.86
Government revenue	485.56
Government savings	-2,172.80
Foreign savings	-15,694.07
Household savings	21,213.38
Firm savings	232.51
Investment	3,579.02
Skilled labour	5,702.60
Unskilled labour	6,758.17
Total capital supply	16,033.20
Total land supply	7,965.53

Source: CGE model base solution.

iv. **Foreign Savings**

Foreign savings show the position of the country's trade balance, that is, the difference between imports (purchases from the rest of the world) and exports (sales to the rest of the world). A surplus trade balance means that the country's exports exceed its imports, while the reverse is true in the case of a deficit trade balance. Results from Table 17 indicate that the country had a surplus trade balance in the base year as the value of exports exceeded imports by ₦15,694 billion. This was largely due to crude oil exports as observed in Table 16. This is supported by the CBN (2012) which revealed that Nigeria's trade balance in 2011 was negative (deficit) for the non-oil sectors; but this was more than compensated for by the large surplus value in the oil sector, resulting in an overall surplus trade balance for the year.

v. **Firm and Household Savings**

Firm savings were conceived in the model as allowance made for the consumption of fixed capital. That is, as firms used their fixed capital for production activities, they saved up part of their revenue as allowance for depreciation as well as for future investments in capital. Firm savings in the base year was ₦233 billion.

Household savings refers to the difference between household consumption expenditure and the sum of their earnings from labour, capital and land. Household savings was ₦21,213 billion (Table 17), suggesting that households were the major source of savings used for investment in the economy.

vi. **Investment**

In this study, it was assumed that all of the savings in the economy was used for investment in capital assets and financial securities. This means that, at equilibrium, investment equals total savings which is made up of government savings, foreign savings, firm savings and household savings. Therefore, the total investment (savings) in the base run was ₦3,579 billion which was spread across the 5 sectors in the model economy.

vii. **Total Labour, Capital and Land Supply**

The total quantity of labour available in the economy is the total value of all the labour employed. The total value of labour employment in the base year, from Table 17, was ₦12,461 billion. This figure was made up of 46% skilled labour and 54% unskilled labour. Labour skill determines its productivity and often its wages. The total capital supply, on the other hand, is the sum total of all the capital assets employed in all the sectors. Total capital supply in the base period was valued at ₦16,033 billion.

Land is often subsumed under capital in most studies. However, due to the critical importance of land to the agricultural sector, and thus to the rural sector, it was disaggregated from capital in this study. Land is a critical factor of production for all the sectors, and particularly so for crop production. The total value of land available to the sectors was ₦7,966 billion. This figure was only about half the value of capital employed in the economy, indicating that the economy was more dependent on capital than on land for its productivity.

viii. **Other Economic Prices**

Economic prices related to aggregates in the model are set to one (1). Examples of these aggregate prices are the Consumer Price Index (CPI), which is an index of the average price of goods and services within the economy, price (wage rate) of skilled and unskilled labour, price of capital, price of land, exchange rate, among others.

4.5.3 Shares of Household Variables in Base Scenario

The shares of base run variables among the households are presented in this subsection. Table 18 gives a breakdown of the shares for the 12 households considered in the model for skilled and unskilled labour income, capital income, land income, total income, household expenditure, household savings and total utility.

i. **Labour Income**

Table 18 shows that skilled labour income in the base year was concentrated in the urban formal sector as 69% of skilled labour income was earned by only the formal urban non poor and moderately poor households. In all, formal urban households accounted for 73% of total skilled

labour income; formal rural households accounted for 4%; informal urban households accounted for 7%; while informal rural households accounted for 16%. The dominance of the urban formal sector was expected due to the higher levels of education and specialization often required of urban formal sector jobs. Unskilled labour income was also dominated by the urban formal sector, albeit the unskilled income gap was less than the skilled. Notwithstanding, the formal urban households earned 57% of unskilled labour; formal rural households earned 6%; informal urban households earned 11%; while informal rural households earned 26%. The relatively high unskilled income share of the informal rural households was expected since agriculture, which was mostly practiced in the rural areas, employs large numbers of unskilled rural workers.

ii. **Capital and Land Income**

The bulk of the capital income in the base period was earned by the rural formal sector households (54%). The urban formal sector households earned 23%, informal urban households earned 7%, while informal rural households had a share of 16% of capital income. Land income was dominated by the rural informal sector households (45%). Further, rural formal sector households got 35% of the total land income, meaning that the rural households received 80% of all land income in the base run, compared to just 20% received by the urban households. This was expected since rural households were usually the owners of rural lands employed for agriculture and industry. Thus, rent income is earned from their lands in addition to income from their own farming activities.

iii. **Total Income**

The addition of the incomes earned by the households from labour, capital and land make up their total income. In the base year 2011, urban formal sector households had a 35% share of total income while their rural counterparts had a 33% share. The households with the least welfare were the urban informal sector households with just an 8% share of total income. The informal rural households earned 24% of total income with the bulk of this income evidently from their land ownership and agricultural activities. Figure 11 shows the base run distribution of total income among the 12 households.

Table 18: Base Scenario Shares of Household Variables

	Household shares (%)												
Variables	**FUN**	**FUM**	**FUC**	**FRN**	**FRM**	**FRC**	**IUN**	**IUM**	**IUC**	**IRN**	**IRM**	**IRC**	**Total**
Skilled labour income	36.22	32.80	4.04	2.42	1.01	0.48	2.94	2.61	1.37	10.43	4.31	1.37	100.00
Unskilled labour income	28.18	22.84	6.33	3.85	1.61	0.76	4.54	4.06	2.14	16.63	6.87	2.18	100.00
Capital income	11.58	8.55	2.47	25.77	26.94	0.79	3.47	3.09	0.84	8.74	5.60	2.14	100.00
Land income	6.48	5.74	1.63	17.95	16.06	1.44	2.71	2.45	0.56	24.00	15.16	5.82	100.00
Total income	17.43	14.42	3.25	16.29	15.74	0.88	3.42	3.06	1.11	13.83	7.74	2.84	100.00
Expenditure	19.92	11.24	3.93	5.30	5.30	5.29	5.23	4.07	3.91	19.56	11.02	5.24	100.00
Savings	15.67	24.06	23.13	16.66	9.78	5.42	2.14	2.77	2.34	1.14	-0.88	-2.24	100.00
Household utility	7.03	4.32	5.55	1.48	1.54	27.45	6.97	6.09	16.28	7.67	7.26	8.35	100.00

Source: CGE model results output of base solution.

Households Key:

FUN – formal urban non-poor

FUM – formal urban moderately poor

FUC – formal urban core poor

FRN – formal rural non-poor

FRM – formal rural moderately poor

FRC – formal rural core poor

IUN – informal urban non-poor

IUM – informal urban moderately poor

IUC – informal urban core poor

IRN – informal rural non-poor

IRM – informal rural moderately poor

IRC – informal rural core poor

iv. **Total Expenditure**

The households that consumed most of the output from the 5 sectors in the base period were the informal rural households with 36% of total expenditure on consumption. The formal urban households had a share of 35% of total expenditure while the formal rural sector households shared 16% of total expenditure. The least consuming households were the urban informal sector households with a 13% share of total expenditure. In all, the rural households consumed more (52%) than the urban households.

v. **Total Household Savings**

Table 18 shows that in the base year, moderately poor and core poor informal rural households experienced dissaving while their non-poor counterparts had just 1% of total savings. This resulted in a net dissaving of 1.98% for the rural informal sector households. Given that these households also consumed the most commodities, it is likely that their consumption was partly financed by transfers from other households or from abroad. Formal urban households had the greatest share of household savings at 63% while formal rural households had 32%. Informal urban sector households had a share of 7% of total household savings. Leland (1968) asserted that the greater wealth in the urban areas of most economies results in more savings coming from those areas. The results obtained showing that urban areas contributed 70% to total saving in the base year supports this assertion.

vi. **Total Household Utility**

Utility refers to the satisfaction derived from an activity, particularly consumption or the inherent worth of something (Rutherford, 2002). In the base period, urban sector households derived 46% of the total household utility while their rural counterparts enjoyed 54%. This was consequent upon the expenditure pattern in both sectors as can be seen in Table 18 where the rural sectors had a larger share of household expenditure. This means that the rural households generally required a larger proportion of their income to attain utility levels than their urban counterparts.

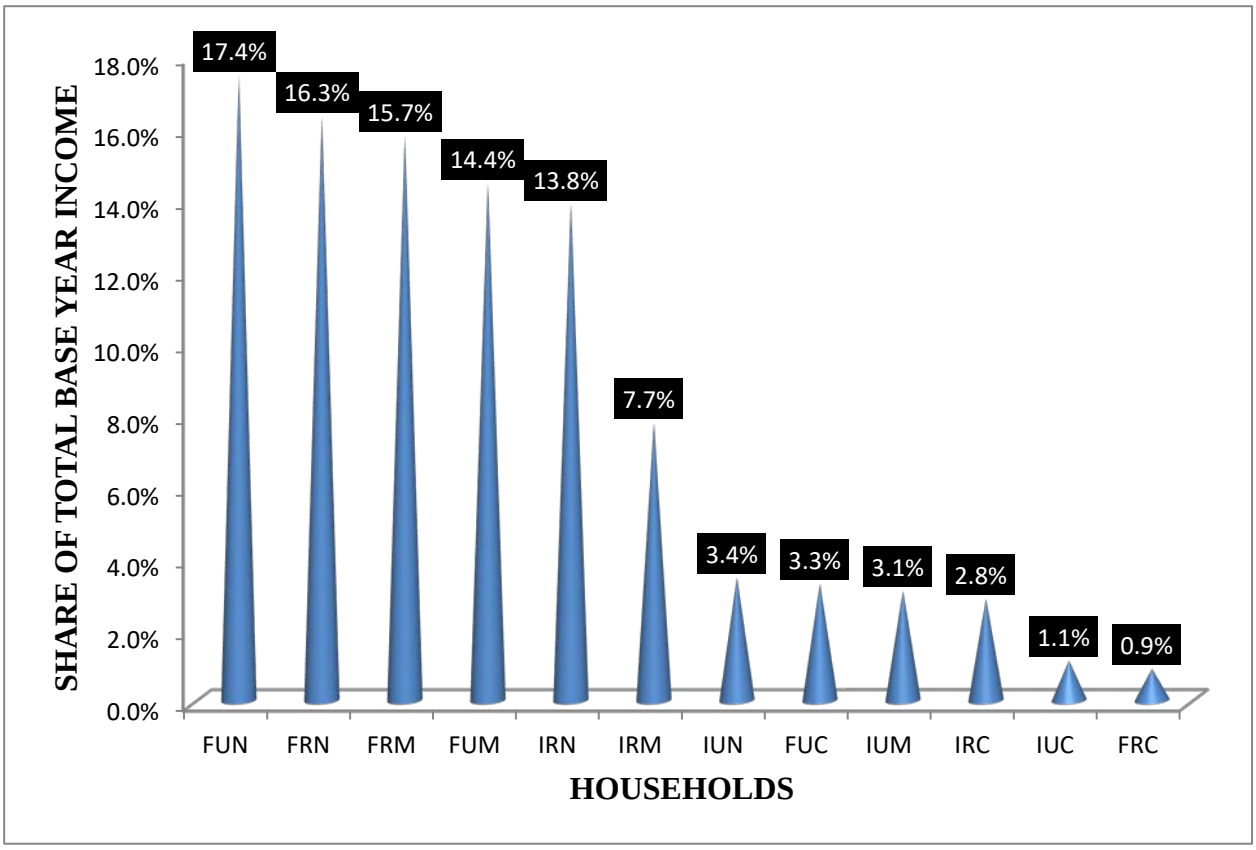


Figure 11: Base Run Distribution of Total Income among the Households

Households Key:

FUN – formal urban non-poor

FUM – formal urban moderately poor

FUC – formal urban core poor

FRN – formal rural non-poor

FRM – formal rural moderately poor

FRC – formal rural core poor

IUN – informal urban non-poor

IUM – informal urban moderately poor

IUC – informal urban core poor

IRN – informal rural non-poor

IRM – informal rural moderately poor

IRC – informal rural core poor

4.5.4 Base Scenario of Shares of Household Incomes by Sector

The households in the model earned their income from the five sectors. Income was earned based on the factors of production owned by the households. Table 19 presents a breakdown of the shares of labour, capital and land incomes earned from each of the five sectors by each of the twelve households. The discussion of the incomes earned is contained in the following subsections.

i. Household Labour Income Shares by Sector

Table 19 shows that urban formal sector households earned most of their labour income from non-agricultural sectors. For instance, both formal urban non-poor (26%) and moderately poor households (31%) earned the bulk of their income through skilled labour supply to the crude oil and mining sector while the shares of their skilled labour income from the crop and other agriculture subsectors were almost negligible. However, only four of the households (FUN, FUM, IUN and IUM) supplied skilled labour to the crude oil and mining sector. Generally, households' skilled labour supply to the sectors was low especially to the agricultural sectors wherein the highest skilled labour income share was supplied by the informal rural households. Overall, skilled labour earnings from the crop subsector made up 20% of total skilled labour income compared to 57% for crude oil and mining and 22% for the utilities sector. Unskilled labour income to the crop subsector accounted for 31% of the total unskilled labour income, with most of it being supplied by the informal rural households. The foregone underscores the importance of agriculture to labour income in the rural areas. The expectation, therefore, is that an increase in agricultural spending by government aimed at boosting labour employment in the sector would benefit the rural households more.

ii. Household Capital Income Shares by Sector

Table 19 shows that, overall, 50% of capital income earned by households came from the crude oil and mining sector, 30% from the utilities and service sector and 20% from the agricultural subsectors. The informal rural households got the largest shares of capital income from crop production with the informal rural non-poor, moderately poor and core receiving 24%, 27% and 29% respectively of their income from capital supplied to the subsector.

Table 19: Base Scenario Shares of Household Incomes by Sector

Households	Sectoral Factor Income Shares (%)																				Total
	Skilled Labour Income					Unskilled Labour					Capital Income					Land Income					
	CRP	OAG	COM	MAN	UTS	CRP	OAG	COM	MAN	UTS	CRP	OAG	COM	MAN	UTS	CRP	OAG	COM	MAN	UTS	
FUN	0.04	0.01	25.68	0.05	6.93	0.08	0.01	17.12	0.11	12.84	0.96	0.19	3.75	0.08	23.98	0.13	0.01	0.00	0.04	7.99	100
FUM	0.05	0.01	31.06	0.06	4.65	0.10	0.01	20.70	0.13	8.61	0.10	0.03	0.00	0.08	25.66	0.15	0.02	0.00	0.03	8.55	100
FUC	0.00	0.00	0.00	0.25	19.28	0.00	0.00	0.00	0.58	35.71	0.00	0.00	0.00	0.07	33.06	0.00	0.00	0.00	0.03	11.02	100
FRN	1.86	0.28	0.00	0.00	0.19	3.52	0.54	0.00	0.00	0.36	3.11	0.83	62.83	0.23	2.02	6.07	0.67	16.71	0.10	0.67	100
FRM	0.80	0.12	0.00	0.00	0.09	1.50	0.23	0.00	0.00	0.17	2.64	0.66	69.17	0.21	1.97	3.95	0.44	17.29	0.09	0.66	100
FRC	7.38	1.12	0.00	0.00	0.04	13.95	2.12	0.00	0.00	0.07	18.16	4.53	0.00	2.45	14.14	27.24	3.02	0.00	1.05	4.71	100
IUN	1.08	0.07	0.26	0.02	12.09	2.04	0.13	0.17	0.05	22.39	2.20	0.22	0.00	0.04	41.82	3.30	0.15	0.00	0.02	13.94	100
IUM	5.24	0.38	0.29	0.03	7.50	9.89	0.73	0.20	0.06	13.90	2.44	0.25	0.00	0.04	41.41	3.66	0.17	0.00	0.02	13.80	100
IUC	0.00	0.00	0.00	0.07	19.41	0.00	0.00	0.00	0.16	35.95	0.00	0.00	0.00	0.02	33.28	0.00	0.00	0.00	0.01	11.09	100
IRN	11.10	0.69	0.00	0.00	0.08	20.98	1.30	0.00	0.00	0.14	24.13	2.45	0.16	0.03	0.81	36.19	1.63	0.04	0.01	0.27	100
IRM	8.20	0.51	0.00	0.00	0.07	15.49	0.96	0.00	0.00	0.12	27.13	2.75	0.28	0.04	1.37	40.70	1.83	0.07	0.02	0.46	100
IRC	7.22	0.38	0.00	0.00	0.00	13.64	0.72	0.00	0.00	0.01	28.45	2.89	0.00	0.07	1.50	42.67	1.92	0.00	0.03	0.50	100
SSTFI	19.57	1.50	57.00	0.17	21.76	31.20	2.40	32.06	0.33	34.01	17.56	2.21	50.03	0.30	29.91	52.24	2.92	24.81	0.26	19.77	

Source: CGE model output of base solution.

Note: SSTFI – Sectoral Shares of Total Factor Income

The urban core poor households received negligible income from capital. Formal rural non-poor (63%) and moderately poor (69%) households earned the bulk of their income from capital supplied to the crude oil and mining sector. In summary, Table 19 suggests that capital income is more important to the rural households than it is to their urban counterparts.

iii. **Household Land Income Shares by Sector**

From table 19, it is clear that land income is most important in the crop production subsector as over 52% of all land income was earned from the subsector in the base run. Crude oil and mining ranks second with 25% of the total land income in the base year. Specifically, the rural informal sector households get the largest land income shares of all the households, and these incomes were earned in the crop subsector (IRN – 36%, IRM – 41% and IRC – 42%). The formal rural core poor households earn the highest land income share among the formal households with 27% of their income coming from land. Land is the most critical factor in crop production. It is thus, expected that the informal rural households, who were owners of the bulk of agricultural land, would earn the most income from land as corroborated by the facts in table 19.

4.5.5 Base Scenario of Shares of Household Expenditure by Sector

Table 20 reveals the base run expenditure pattern of households in the model on commodities of the five sectors. The table shows that households follow an almost uniform expenditure pattern with their highest expenditure shares going to the utilities and services sector except for the informal rural moderately poor households who spent 38% of their income on the crop subsector and 35% on utilities and services sectors. The urban households were the greatest consumers of commodities from the utilities sector. For instance, in the utilities sector, the formal urban non-poor, moderately poor and core poor households had 92%, 86% and 82% expenditure shares respectively.

Similarly, their informal counterparts had 62%, 79% and 83% expenditure shares respectively in the utilities and services sectors. This was expected due to the greater prevalence of the output of the sector in the urban centers.

Table 20 Base Scenario Shares of Household Expenditure by Sector

Household Groups	Sectoral Expenditure Shares (%)					Total
	CRP	OAG	COM	MAN	UTS	
FUN	2.20	1.07	0.75	4.03	91.94	100
FUM	3.91	1.90	0.81	7.15	86.24	100
FUC	7.73	3.76	1.01	5.28	82.22	100
FRN	23.26	11.33	0.50	3.92	60.98	100
FRM	23.28	11.34	0.46	3.91	61.02	100
FRC	23.31	11.36	0.30	3.92	61.12	100
IUN	6.67	3.25	2.14	26.16	61.78	100
IUM	5.61	2.73	1.57	10.71	79.37	100
IUC	5.85	2.85	1.05	7.56	82.70	100
IRN	38.49	18.75	0.62	7.28	34.87	100
IRM	18.94	9.22	0.78	9.14	61.92	100
IRC	21.71	10.57	0.78	5.22	61.72	100
SSHE	16.44	8.01	0.81	7.24	67.50	100

Source: CGE model base solution.

Note: SSHE – Sectoral Shares of Household Expenditure

On the other hand, the rural households were the largest consumers of agricultural commodities as they had the highest expenditure shares in the crop production and other agriculture subsectors. Precisely, the formal rural non-poor, moderately poor and core poor households each spent 23% share on the crop subsector and 11% on the other agriculture subsector. The informal rural non-poor, moderately poor and core poor households had less uniform expenditure shares than the formal rural households but the pattern remained the same as they spent 38%, 19% and 22% respectively on the crop subsector and 19%, 9% and 11% on the other agricultural subsector. These patterns were expected since the rural households have greater access to agricultural products which were mostly produced in the rural environment. Furthermore, any policy that can affect agricultural output, such as an increase or decrease in government spending in the sector, was expected to significantly affect the utility of rural households.

Overall, 68% of household expenditure went to the utilities and services sector. The crop subsector ranked second with a total share of 16% of household expenditure while the crude oil and mining sector received the least expenditure share from the households as they spent less than 1% of their expenditure on the sector's output. This was not unexpected as a large proportion of the output of the crude oil sector (68%) was exported in the base run as shown in Table 16.

4.6 **Effects of Wage Policy on Nigeria's Economy**

The results of the simulation experiments performed are presented in this subsection. Using the empirical CGE model for the study, changes were made to each exogenous variable of interest in the model and the changes in the endogenous variables were observed. The magnitude and direction of these percentage changes indicate the response of the economy to the policy change. The outcomes of the three policy scenarios tested (12%, 30% and 67% increases in minimum wage) are presented hereby.

4.6.1 **Effect of Twelve and Thirty Percent Increases in Minimum Wage**

Figure 12 shows the outcomes of a 12% increase in the minimum wage in the Nigerian economy on the sectors, macroeconomic aggregates as well as households. Similar results were obtained

with a 30% increase as can be observed in Figure 13. The following sections discuss the effects of minimum wage increases on the 5 sectors, the macroeconomics of Nigeria and the households.

i. **Effects of 12% and 30% Increases in Minimum Wage on the Economic Sectors**

Generally, it was observed that both levels of increase in the minimum wage had negative effects on all the sectors of the economy except for the crude oil and mining (MAN) sector which was observed to be the most capital intensive of all the sectors. With a 12% increase in the minimum wage, domestic output declined by 5.1%, 3%, 2% and 2.6% in the Crop (CRP), Other Agricultural (OAG), Manufacturing (MAN) and Utilities (UTS) sectors respectively while it increased by 0.56% in the Crude oil and mining (COM) sector. Similar effects were observed in all the sectors with a 30% increase but with greater changes as presented in figure 13. Expectedly, this was due to the fact that capital could be more readily substituted for labour (which becomes more expensive with an increase in minimum wage) in the COM sector, leading to increased output. This outcome tallies with the findings of Taiwo *et al*., (2009) where a simulated 25% increase in minimum wage in Nigeria revealed that output declined in other sectors of the economy but increased in the refining as well as mining and quarrying sectors.

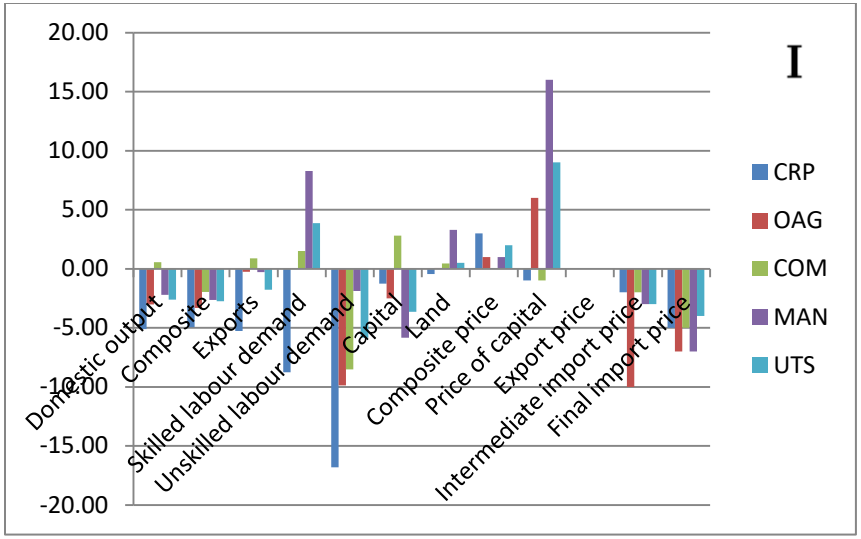
Moreover, it was observed that the quantity of composite commodity decreased across all the sectors under both minimum wage simulations. However, this decline was greatest with a 30% simulation in the CRP subsector where the composite commodity declined by 9.5%. Exports declined from all the sectors in both instances except for the COM sector which experienced 0.89% and 0.97% increases in exports under the 12% and 30% simulations respectively. Employment of skilled labour increased across all the sectors except in the CRP and OAG subsectors. This was as a result of the fact that labour was mobile across sectors and substitutability exists between skill categories. Therefore, with an increase in the price of unskilled labour, more skilled labour would be hired across the sectors. However, a decline was experienced in skilled labour employment in the CRP subsector which was likely the result of increased wage demands of the few skilled workers in the largely informal, low-skilled CRP subsector. Expectedly, the employment of unskilled labour declined across all sectors under the 12% and 30% simulated wage increases as the cost of hiring labour was observed to have increased. Capital demand also declined in all sectors except the COM sector, with the most

notable being a 13.5% reduction in capital demanded by the MAN sector with a 30% increase in minimum wage. Composite price increased across all sectors except the COM sector where there was a zero-net effect in both simulations.

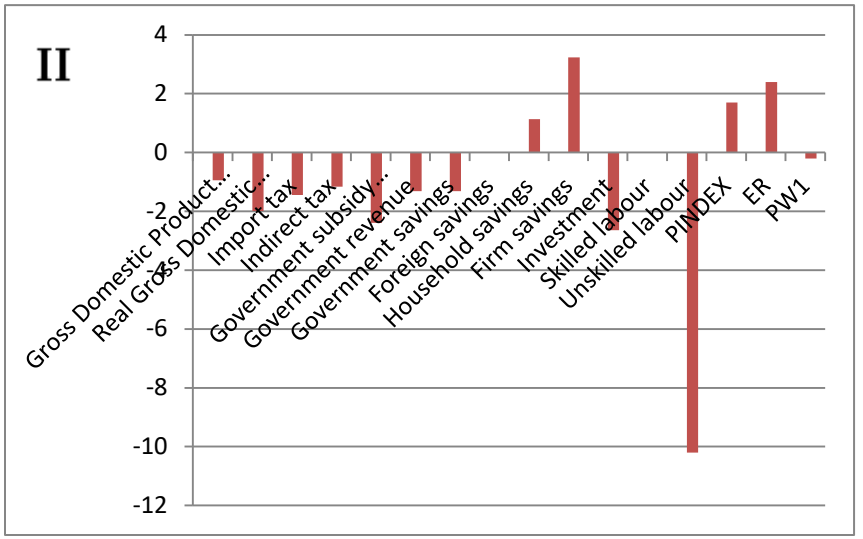
ii. **Effects of 12% and 30% Minimum Wage Increases on Macroeconomic Aggregates**

The effects of the two wage increase scenarios on the macroeconomy of Nigeria are shown in segment II of Figures 12 and 13 respectively. It can be seen that both the gross domestic product (GDP) and real gross domestic product (RGDP) fell by 0.95% and 1.99% respectively with a 12% increase in minimum wage. This was expected as outputs from most of the sectors had declined. With a 30% increase in minimum wage, however, the GDP and RGDP similarly fell by 2.11% and 4.35% respectively. Imports taxes earned by the government fell by 1.45% and 2.88% as the sectors that were able to expand domestic output (like the COM sector) could do so, thereby reducing the incentive for imported commodities. Indirect taxes earned by the government also reduced by 1.16% and 2.35% respectively with 12% and 30% increases in the minimum wage due to reduced output from the sectors.

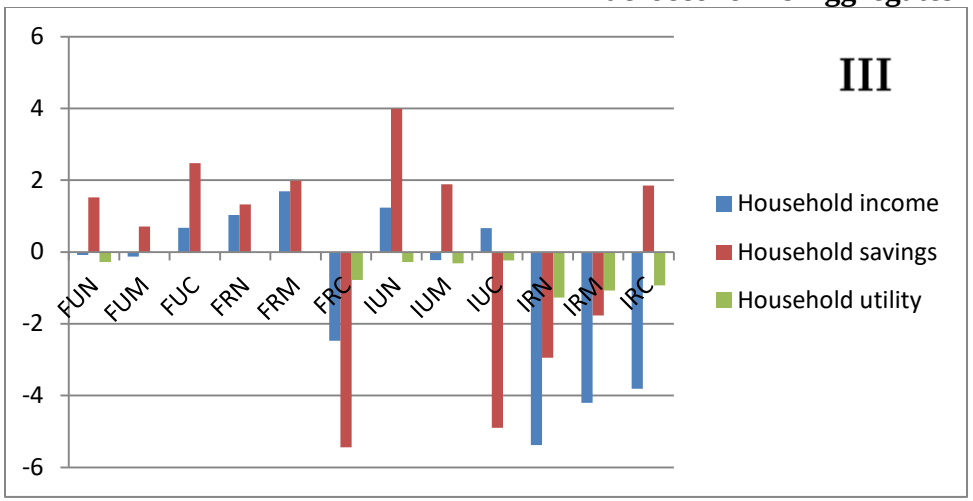
Government revenue and savings also declined while, conversely, household savings increased due to higher labour income earned from the minimum wage increase. On the other hand, there was increase in firm savings, indicating that they were able to cut down on costs by substituting capital for the more expensive labour. Investment in the economy fell by 10% and 21% respectively under the two scenarios, indicating a lower savings level in the economy. Unskilled labour demand expectedly fell due to its higher price in both instances. The consumer price index, which showed the general level of prices in the economy, worsened by an alternate of 1.7% and 4% for both minimum wage increases. This shows how much inflationary pressure was imposed on the economy as a result of the minimum wage increases. The level of inflation also affected the exchange in both cases as the Naira devalued by 2.4% and 5.3% respectively. With a decrease in the demand for unskilled labour, the price of its complement – skilled labour – declined by 0.2% and 1% in both cases.



I – Effects of a 12% Increase in Minimum Wage on the Sectors

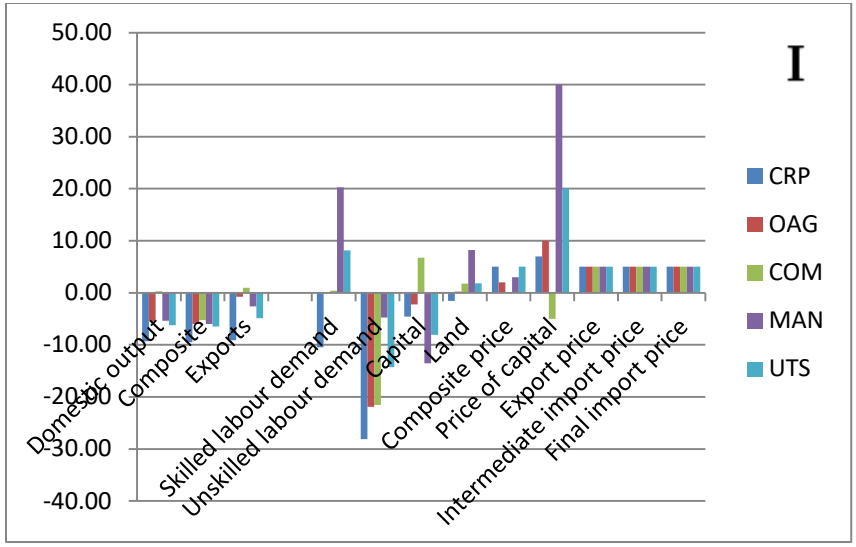


II – Effects of a 12% Increase in Minimum Wage on the Macroeconomic Aggregates

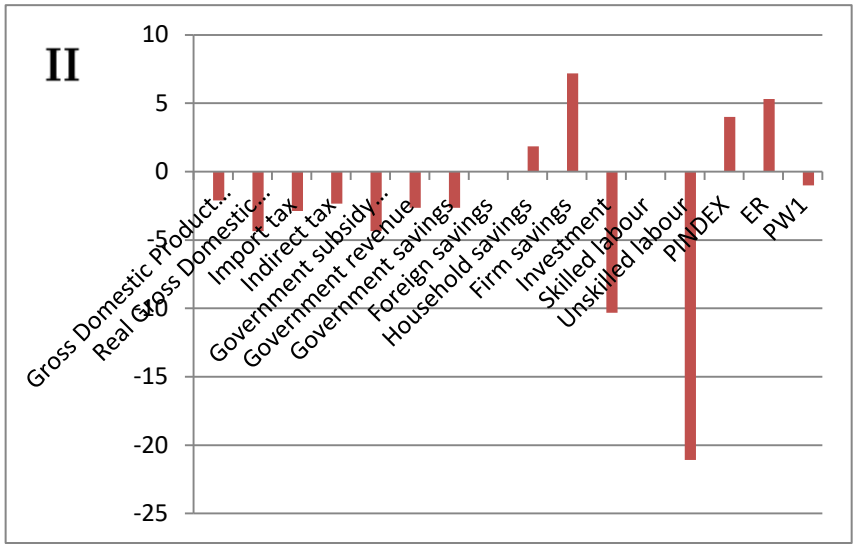


III - Effects of a 12% Increase in Minimum Wage on the Households

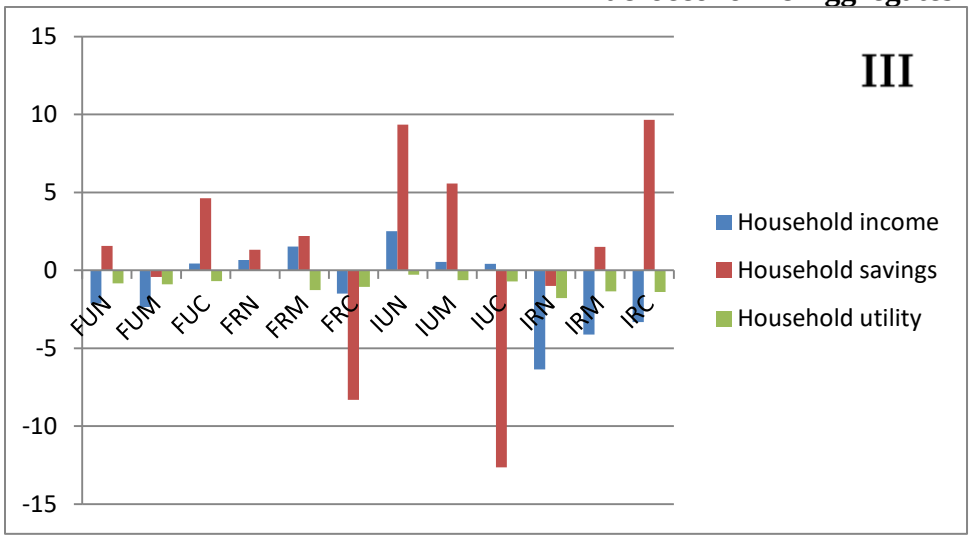
Figure 12: Economic Effects of a 12% Increase in Minimum Wage



I – Effects of a 30% Increase in Minimum Wage on the Sectors



II – Effects of a 30% Increase in Minimum Wage on the Macroeconomic Aggregates



III - Effects of a 30% Increase in Minimum Wage on the Households

Figure 13: Economic Effects of a 30% Increase in Minimum Wage

iii. **Effects of 12% and 30% Increases in Minimum Wage on Households**

The changes in the key household variables in the model as a result of the wage increases are shown in segment III of Figures 12 and 13 respectively. In both cases of minimum wage increases, the total incomes of most of the households decline. Despite the higher labour income received from the minimum wage increases, the households experienced losses of capital and land income due to reduced production activities in the economy and consequently incurred a net loss of income as well. The reduced total income then resulted in reduced savings for those households as observed in figures 12 and 13. In all of these, the effect on the core poor households was worse as most of their savings were lost when the minimum wage was increased by 30%. The FRC and IUC households similarly lost 8.3% and 12.6% respectively of their savings.

Formal rural households (except for the core poor household) experienced increase in their income in both wage simulations. This was expected as both the FRN and FRM households enjoy the largest proportions of capital income in the economy (see Table 19). Therefore, with the production sectors substituting labour for more capital, the FRN and FRM households earn more income from capital than other households. In relation to household utility, a 12% minimum wage increase made all the households experience a fall in utility except for the FUM, FUC, FRN and FRM households whose utilities remain unchanged. In the case of a 30% increase, all households, except the FRN households, enjoyed less utility. This indicates that the general rise in price levels in the economy meant that most households had to decrease their consumption of goods and services, leaving them worse off despite earning more wages.

4.6.2 Effects of a Sixty Seven Percent Increase in Minimum Wage

Figure 14 reflects the outcomes of a 67% increase in the minimum wage in the Nigerian economy on all sectors, macroeconomic aggregates and the households. With labour unions agitating for the minimum wage to rise from the current level of ₦18,000 to ₦30,000, the following subsections elucidate the simulated effects of this possible increase on the sectors, the macroeconomics of Nigeria and the households. It was however, observed that the results obtained were similar to those of the 12% and 30% simulations although the effects of 67% minimum wage increase were more severe.

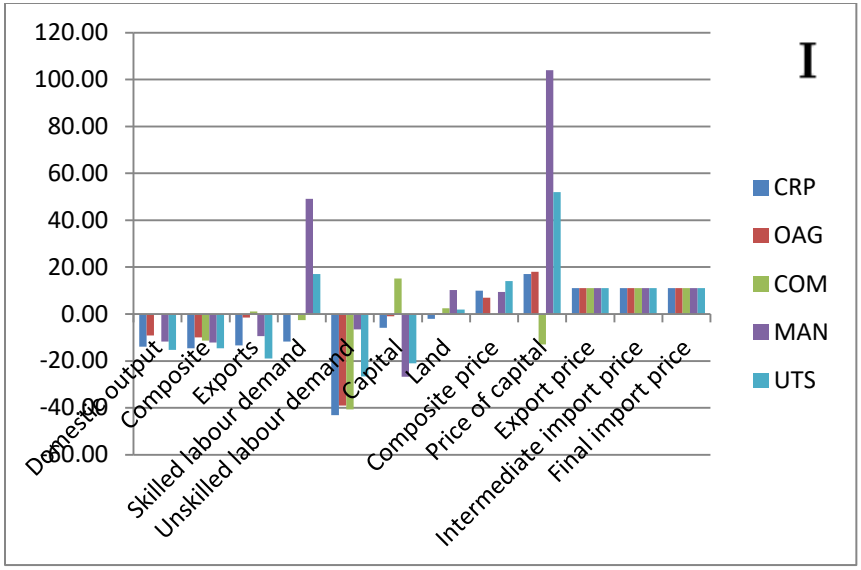
i. **Effects of a 67% Increase in Minimum Wage on the Sectors of the Economy**

Figure 14 reveals that a 67% increase in the minimum wage would adversely affect output in all the sectors of the economy. Both CRP and UTS outputs declined by 14% and 15% respectively. Similarly, the COM sector suffered a decline of 0.28% in output indicating that the sector was no longer able to absorb the high price of labour through capital substitution. Exports also declined across all sectors except the COM sector where exports increased by 1%. Unskilled labour demand declined across all sectors due to its higher price. Skilled labour demand also reduced in the CRP, OAG and COM sectors by 11.8%, 0.04% and 2.6% respectively, while it increased in the MAN and UTS sectors by 49% and 17% respectively.

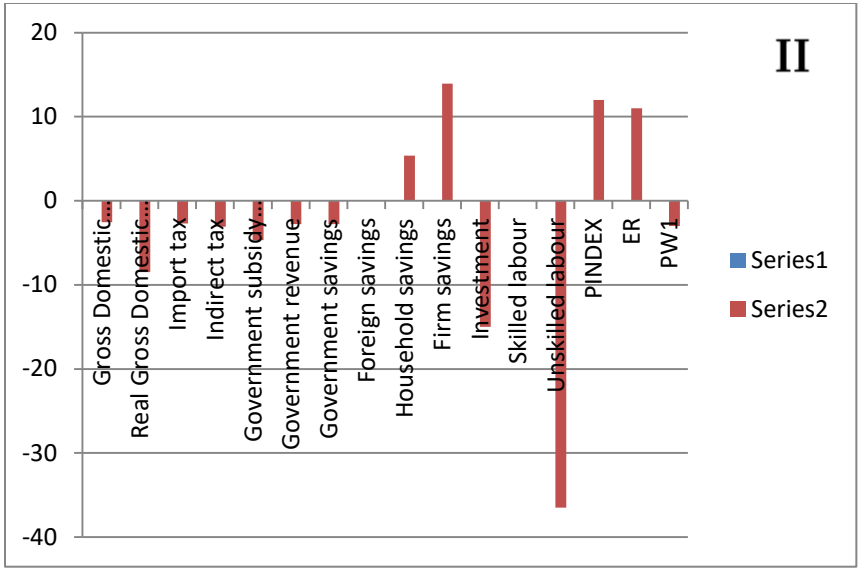
Capital demand reduced in all sectors except the COM sector where it increased by 15%. This may likely be due to the fact that the sector was better able to substitute capital for labour than the other sectors whose capital demand declined due to their inability to pay for labour to make use of more capital. Again, this might be a direct consequence of the 13% fall in the price of capital in the COM sector as shown in Figure 14. Land demand fell by 2% in the CRP subsector, a likely consequence of the high cost of hiring labour to work on the farms. All export and import prices across the sectors experienced a rise by 11%. Also, the price of the composite commodity rose in all the sectors except the COM sector where it remained unchanged.

ii. **Effects of a 67% Increase in Minimum Wage on Macroeconomic Aggregates**

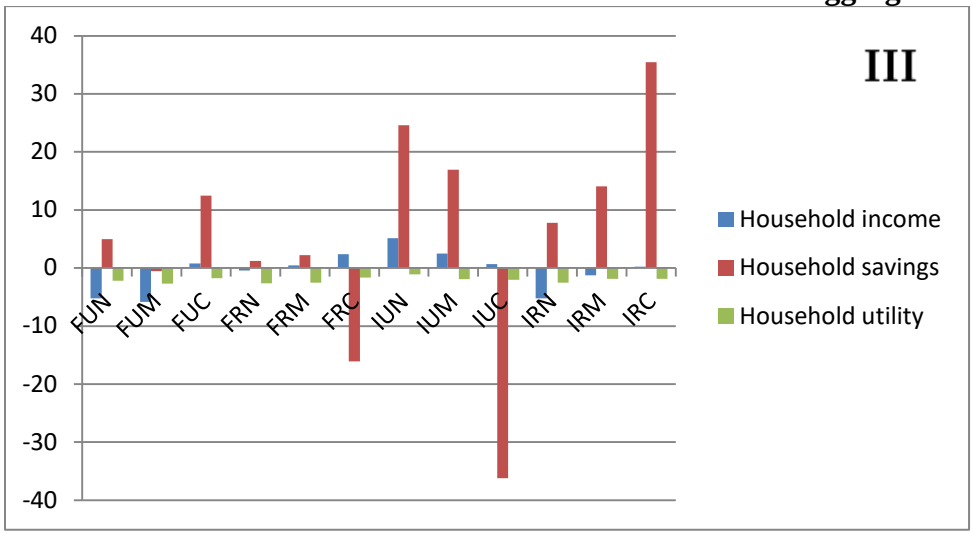
As seen in Figure 14, a 67% increase in minimum wage in Nigeria would have a contractionary effect on the macroeconomy. Both GDP and RGDP would fall by 2.6% and 8.5% respectively. The higher fall of the RGDP is a direct reflection of the huge inflationary pressure caused by the wage increase as the price index can be seen to have risen by as much as 12%. Government lost revenue from the respective reductions of 2.7% and 3.1% in import and indirect taxes. Therefore, overall revenue accruing to the government reduced by 2.8%. Investments dropped by 15% while the exchange rate dipped by 11%. Unskilled labour demand reduced by 36% whereas skilled labour demand remained unchanged.



I – Effects of a 67% Increase in Minimum Wage on the Sectors



II – Effects of a 67% Increase in Minimum Wage on the Macroeconomic Aggregates



III - Effects of a 67% Increase in Minimum Wage on the Households

Figure 14: Economic Effects of a 67% Increase in Minimum Wage

iii. **Effects of a 67% Increase in Minimum Wage on Households**

Figure 14 indicates that total income for 7 out of the 12 households increased from their base year values when the minimum wage was increased by 67%. This was a marked improvement over the previous scenarios where only 5 households experienced an increase in their total income. This indicates that a much higher increase in the minimum wage could be beneficial to households in the short term. Similarly, households were seen as having better saving power as savings improved for 9 out of the 12 households; only the FUM, FRC and IUC households experienced drops in their savings of 0.54%, 16.06% and 36.19% respectively. However, utility declined for all the households. This shows that despite the higher wage income resulting from a high minimum wage regulation, the consequent higher prices of goods and services in the economy meant that households do not experience improvements in their welfare in the long run; rather, they tend to be worse off.

In summary, increasing the minimum wage in Nigeria would result in income and utility loses for most households and a general contraction in the macroeconomy of the country. Further, sectoral outputs would be negatively affected overall.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of Major Findings

This study empirically sought to establish how rural households' participation in the labour market affects their welfare. Using the CGE framework, it established how urban sector wage rigidities such as the minimum wage policy can affect the rural economy and welfare of households.

Secondary data from the GHS (2010/11) was used in the study to profile the rural labour market in Nigeria, revealing the labour supply and demand situation; gender dimensions to labour use, wages and inequality; labour market participation decision and assets ownership of participating and non-participating household heads. A reverse form of the conventional method of fuzzy sets was used to elicit welfare scores for the households. Regression analysis, which included the use of Heckman and ordered probit models, was used to analyze the relationship between household welfare and labour market participation. The static CGE model developed for the Nigerian economy was used to examine the effects of different minimum wage increases on the economy as a whole and the welfare of households, especially the informal sector rural households.

The profiling of the rural households revealed that 81% of them were headed by males whose average age fell around the bracket of 50 years, the period when most are economically active. About 2.4% of the household heads had no formal education while only 8.5% had tertiary education with female household heads having a share of 1.1% of this. Household sizes were fairly large at an average of about 6 persons, while the average monthly income of the household heads was ₦17,060.16. Majority of the household heads (above 50%) engaged in more than one economic activity. Agriculture was however, found to be the dominant activity of rural households as it was the primary activity of 57.6% and 58% of male and female household heads respectively. Other real sector activities such as manufacturing, building and construction employed 7.3% of male and 12.4% of female household heads. Labour market participation was 34% among the household heads with female heads having a 5.5% share of participation. Labour market participants were mainly economically active (19.4%). Most had at least primary level

education or its equivalent (33.2%) and spent an average of 39.4 hours in their economic activities per month. Wage inequality was found to be low throughout rural Nigeria with a Gini coefficient of 0.38. Among the geopolitical zones, it was highest in the North-Central zone (0.37) and lowest in the South-Eastern zone (0.25). With respect to gender, wages earned by men showed the least inequality (0.34) while those of children showed the highest inequality (0.36). Welfare was generally low among the households with a mean fuzzy sets welfare index (MWI) of 0.12, occasioned by low assets ownership. Households whose heads participated in the labour market were the least deprived (MWI = 0.13). The ordered probit regression showed that labour market participation reduced the probability that a household would have high welfare by 0.167, significant at 5%.

The interrelationship of the agricultural sector with other sectors in the economy in the 2011 accounting period showed that crop production is an important subsector in the Nigerian economy being responsible for 24% of the total output for the base year with the other agriculture sector making up just 3% of the total output. The utilities and services sector was the dominant sector, accounting for 33% of the total output. Crude oil and mining ranked second with 29% of the total output while manufacturing contributed 11%. The largest exporter in the base year was the crude oil and mining sector with 68.2% of the total exports. Exports from the crop subsector made up 30% of the total exports while other agriculture shared less than 1% of total exports. The utilities and services sector was the largest importer of finished goods with a share of 65% of final imports. The crop subsector accounted for 19.5% of skilled labour employment and 31.2% of unskilled labour while the other agriculture sector accounted for only 1.5% and 2.4% respectively. Land demand was highest in the crop subsector as expected as 52% of total land was employed in the sector. Government revenue came more from import taxes than from indirect taxes. The country showed a favourable trade balance in the base year; however government ran at a deficit of ₦2,172.80 billion. Skilled labour income came mostly from the urban formal sector with 73% of the total income. Capital and land incomes were dominated by the rural formal sector with 54% and 35% of the respective totals. The crop subsector accounted for 16% of total household expenditure while the other agric sector earned a share of 8%. Household expenditure was dominated by the utilities and services sector with 67.5% of the total.

The simulation of different minimum wage levels on the economy with the CGE revealed generally that, wage rigidity has adverse effects on the economy. With a 12% increase in the minimum wage, domestic output declined in all sectors except the crude oil and mining sector. Similar effects were observed with 30% and 67% increases but with greater changes. There was also a general decline in labour employment due to the higher price of labour. Most macroeconomic aggregates fell including GDP and real GDP. Household savings, however, increased in all cases but there were huge inflationary pressures represented by increases in the price index in each of the three scenarios. Investments as well as household utility declined in each case, indicating that in the long run minimum wage policies, may not necessarily result in better household welfare; to the contrary, households may be left worse off.

5.2 **Conclusion**

This study has shown the welfare implications of rural households' participation in the labour market as well as how macroeconomic wage policy affects the economy and households within it. Rural labour market activities are male dominated and wages are generally low and wage inequality is low in the rural sector. Rural households are asset poor which results in an unfavourable welfare situation. Participation in the labour market tends to exacerbate the welfare problem as incomes are generally low because they are determined by the forces demand and supply of labour and not by policy regulation.

In this study, minimum wage legislation has been shown to have significant contractionary effects on the Nigerian economy. Sectoral outputs are reduced and government income is adversely affected. This negative impact comes from heightening the cost of employing labour in the different sectors. Due to the labour intensive nature of most production activities in Nigeria and the high cost of capital, capital substitution is difficult for the producers. Capital availability is worsened by a decline in investment in the economy. The study revealed that households are worse off with minimum wage regulation as their utility declines due to the fact that they have to reduce their consumption as commodities become more expensive due to a higher consumer price index. Progressive inflationary pressures from the increased labour wages also negatively

affect the exchange rate and make imported commodities more expensive and unavailable as cheaper alternatives to domestic commodities.

If the minimum wage in Nigeria is increased to ₦30,000 in line with current agitations by labour unions, crop output will fall by 14% while other agriculture output will fall by 9%. Also employment levels will fall significantly in the agricultural sector. Domestic production will become too expensive and make exports less attractive for both the producers and the potential outside markets. Any short-term benefits by way of increased wages for households will become insignificant as the purchasing power of household income would be drastically depleted by inflation. Thus, household welfare would be compromised by minimum wage increases that are not backed by measures to boost productivity in the domestic economy.

5.3 **Policy Recommendations**

i. Regulation of the informal sector: It was found that rural households' participation in the labour market did not improve welfare. This suggests that their unregulated incomes are subject to fluctuations due to seasonality of agricultural production which was seen to be the main employment of the rural households. It is therefore recommended that some form of regulation in wages of informal/agricultural sector workers be implemented (especially during the off-season) in order to offer income protection from the combined negative effects of oversupply of informal labour and seasonality in labour demand.

ii. Productivity enhancement: The study revealed that the larger the farm size held by a household, the worse its welfare was. Properly targeted schemes that can improve their productivity such as input subsidy schemes, innovation dissemination and training may go a long way to improve household welfare.

iii. More objective minimum wage determination: Minimum wage determination should take into consideration the welfare/poverty index as well as the productivity of the workforce, rural and urban. This would ensure that a proper trade off point is determined, one which would reflect how much productivity gains the nation can afford to sacrifice in order to increase welfare gains to the households.

iv. Complementary policies to minimum wage regulation: The macro-simulations carried out in this study showed that increases in minimum wage benefit the households through higher

labour incomes. These benefits are, however, not sufficient in themselves to cushion the effects of the inflationary pressures on the real incomes of the households besides the increased unemployment. Therefore it is recommended that any minimum wage increase must be accompanied by other policies that will stimulate domestic output and employment. This would counteract the contractionary effects of the minimum wage regulation.

v. Targeting worst-hit sectors after policy shock: The simulations also revealed that the crop production subsector and the utilities and services subsectors would be the worst affected by minimum wage increases in terms of output and employment loses. These two sectors were seen to be the highest contributors to domestic output and the crop subsector also contributes immensely to foreign exchange earnings through exports. Therefore, the government should implement sector-specific policies that would protect these two sectors and boost the outputs and exports.

vi. Welfare enhancement programmes: Government must implement programmes that would protect the core poor households who suffer the most from the repercussions of wage policies. Informal urban core poor households, for instance, lose most of their savings with a 67% minimum wage increase than would the other household groups and then suffer significant utility decline. This might be as a result of not having other supplementary income sources like their rural counterparts who are also farmers. Welfare programmes should be targeted at such households.

5.4 **Recommendations for Further Studies**

The following suggestions are made for future studies which could enhance the outcome and policy relevance of the findings:

i. It was not possible to incorporate other forms of tariffs into the model apart from indirect and import taxes. Future studies can include company income tax, property taxes among others, so as to reflect government income more realistically.

ii. Labour market imperfections such as job-skill mismatch and crowding out were not introduced directly into the model. This can be done in further studies to make the general equilibrium model closer to reality.

iii. The study was only able to simulate a static Nigerian economy. Future studies can introduce dynamics in order to show changes in policy effects over a few years.

iv. In this study, output was not separated into formal and informal sector output. Future studies can disaggregate output in order to isolate the effect of government policy on the distinct output categories.

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Appendix

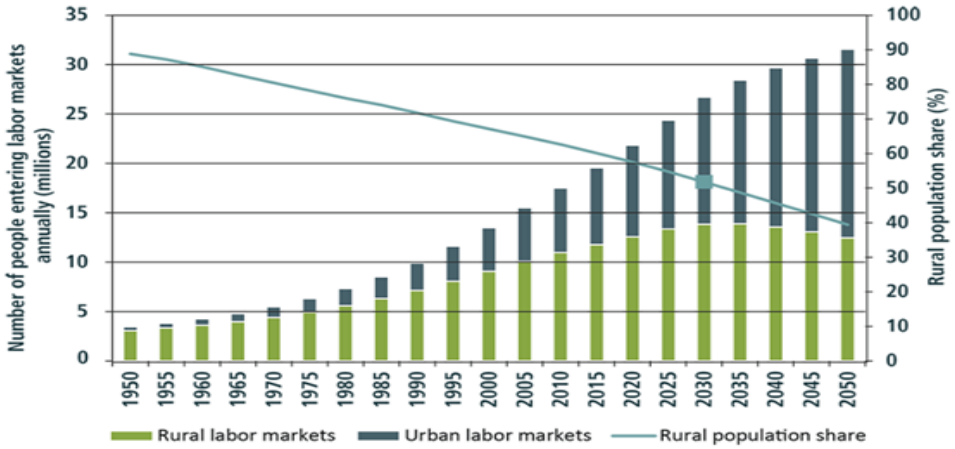

Figure 1: Rural Population Share and Number of People Entering the Rural and Urban Labour Markets Annually in SSA 1950 – 2050
Source: IFPRI

Table 1: Federal Government Wage Policies from 1972 – 2000

Policy	Policy action	Date effective
Udoji Commission (1972/1974)	Wage increases ranged from 12% to 30%. Minimum wage of N60 (US$100) per month. Maximum wage of N1,025 (US$1,708)	1974
Minimum Wage Act of 1981	Minimum wage of N125 (US$209)	1981
Minimum Wage (Amendments) Decree 1990	Minimum wage of N250 (US$31)	1991
Federal Budget (1993)	45% across the board increase in government workers' salaries resulting in the increase of minimum wage from N250 (US$11.4) per month to N363 (US$16.5)	1993
Government Directive on Wages (1998)	Minimum wage of N3,500 (US$41) for federal workers Minimum wage of N3,000 (US$35) for state government workers	September 1998
Minimum Wage Act of 2000.	Minimum wage of N=7,500 (US$75) for federal workers Minimum wage of N5,500 (US$55) state government and private sector workers	May 2000

Source: Aminu (2011)

Table 5: Welfare Attributes used for Fuzzy Sets Analysis (From GHS Wave II Data)

Household assets	Own Hi-Fi sound system
Own furniture (3/4 piece sofa set)	Own microwave
Own furniture (chairs)	Own iron
Own mattress	Own TV set
Own bed	Own computer
Own mat	Own DVD player
Own sewing machine	Own satellite dish
Own gas cooker	Own musical instrument
Own stove (electric)	Own mobile phone
Own stove (gas, table)	Own inverter
Own stove (kerosene)	Own other household assets
Own fridge	
Own freezer	**Socioeconomic situation**
Own air conditioner	Situation where household did not have enough food
Own washing machine	
Own electric clothes dryer	
Own bicycle	**Agricultural assets**
Own motorbike	Own land
Own cars and other vehicles	Own farm machine
Own generator	
Own fan	
Own radio	**Education**
Own cassette recorder	Household head has formal education

Table 21: Sectoral Effects of 12% and 30% Increases in the Minimum Wage

Variables	CRP 12%	CRP 30%	OAG 12%	OAG 30%	COM 12%	COM 30%	MAN 12%	MAN 30%	UTS 12%	UTS 30%
Domestic output	-5.11	-9.32	-3.02	-5.48	0.56	0.26	-2.22	-5.39	-2.61	-6.24
Composite	-4.95	-9.52	-3.32	-5.98	-1.96	-5.24	-2.65	-6.00	-2.76	-6.47
Exports	-5.27	-9.11	-0.27	-0.78	0.89	0.97	-0.28	-2.62	-1.77	-4.87
Skilled labour	-8.76	-10.50	0.01	-0.04	1.50	0.42	8.28	20.25	3.88	8.17
Unskilled labour	-16.81	-28.13	-9.87	-21.90	-8.52	-21.54	-1.87	-4.76	-5.84	-14.32
Capital	-1.25	-4.58	-2.50	-2.25	2.82	6.72	-5.85	-13.54	-3.65	-8.07
Land	-0.44	-1.57	0.06	0.23	0.46	1.74	3.29	8.19	0.50	1.82
Composite price	3.00	5.00	1.00	2.00	0.00	0.00	1.00	3.00	2.00	5.00
Price of capital	-1.00	7.00	6.00	10.00	-1.00	-5.00	16.00	40.00	9.00	20.00
Export price	0.00	5.00	0.00	5.00	0.00	5.00	0.00	5.00	0.00	5.00
Intermediate import price	-2.00	5.00	-10.00	5.00	-2.00	5.00	-3.00	5.00	-3.00	5.00
Final import price	-5.00	5.00	-7.00	5.00	-5.00	5.00	-7.00	5.00	-4.00	5.00

Source: CGE model simulations

Table 22: Macroeconomic Effects of 12% and 30% Increases in the Minimum Wage

Variable	12% increase	30% increase
Gross Domestic Product (GDP)	-0.95	-2.11
Real Gross Domestic Product (RGDP)	-1.99	-4.35
Import tax	-1.45	-2.88
Indirect tax	-1.16	-2.35
Government subsidy payments	-2.40	-4.35
Government revenue	-1.31	-2.64
Government savings	-1.31	-2.64
Foreign savings	0.00	0.00
Household savings	1.13	1.85
Firm savings	3.24	7.18
Investment	-2.64	-10.33
Skilled labour	0.00	0.00
Unskilled labour	-10.21	-21.09
Price index	1.70	4.00
Exchange rate	2.40	5.30
Price of skilled labour	-0.20	-1.00

Source: CGE Model Simulations

Table 23: Effects of 12% and 30% Increases in the Minimum Wage on Households

Households	Percentage change in household variables					
	Income 12% min. wage	Income 30% min. wage	Savings 12% min. wage	Savings 30% min. wage	Utility 12% min. wage	Utility 30% min. wage
FUN	-0.09	-2.13	1.52	1.56	-0.28	-0.83
FUM	-0.13	-2.35	0.71	-0.42	0.00	-0.90
FUC	0.67	0.45	2.47	4.62	0.00	-0.70
FRN	1.03	0.67	1.32	1.32	0.00	0.00
FRM	1.69	1.52	1.99	2.20	0.00	-1.27
FRC	-2.47	-1.49	-5.44	-8.30	-0.78	-1.06
IUN	1.23	2.50	3.99	9.35	-0.28	-0.28
IUM	-0.23	0.54	1.88	5.57	-0.32	-0.64
IUC	0.67	0.42	-4.90	-12.63	-0.24	-0.72
IRN	-5.38	-6.37	-2.95	-1.00	-1.27	-1.78
IRM	-4.20	-4.12	-1.77	1.50	-1.07	-1.34
IRC	-3.81	-3.32	1.85	9.65	-0.93	-1.40

Source: CGE Model Simulations

Table 24: Sectoral Effects of a 67% Increase in the Minimum Wage

Variables	CRP	OAG	COM	MAN	UTS
Domestic output	-13.96	-9.14	-0.28	-11.68	-15.25
Composite	-14.60	-9.97	-11.28	-12.17	-14.59
Exports	-13.32	-1.45	1.09	-9.45	-18.96
Skilled labour demand	-11.77	-0.04	-2.61	49.08	17.04
Unskilled labour demand	-43.15	-39.03	-40.60	-6.59	-26.63
Capital	-5.91	-0.98	15.10	-26.74	-21.01
Land	-2.01	0.28	2.52	10.25	1.96
Composite price	10.00	7.00	0.00	9.40	14.00
Price of capital	17.00	18.00	-13.00	104.00	52.00
Export price	11.00	11.00	11.00	11.00	11.00
Intermediate import price	11.00	11.00	11.00	11.00	11.00
Final import price	11.00	11.00	11.00	11.00	11.00

Source: CGE Model Simulations

Table 25: Macroeconomic Effects of a 67% Increase in the Minimum Wage

Variable	% Change
Gross Domestic Product (GDP)	-2.57
Real Gross Domestic Product (RGDP)	-8.49
Import tax	-2.70
Indirect tax	-3.09
Government subsidy payments	-4.67
Government revenue	-2.77
Government savings	-2.77
Foreign savings	0.00
Household savings	5.37
Firm savings	13.94
Investment	-15.00
Skilled labour	0.00
Unskilled labour	-36.49
Price index	12.00
Exchange rate	11.00
Price of skilled labour	-3.00

Source: CGE Model Simulations

Table 26: Effects of a 67% Increase in the Minimum Wage on Households

	Percentage change in household variables		
Households	Income	Savings	Utility
FUN	-5.25	4.98	-2.22
FUM	-5.84	-0.54	-2.70
FUC	0.76	12.47	-1.75
FRN	-0.44	1.23	-2.63
FRM	0.45	2.21	-2.53
FRC	2.36	-16.06	-1.63
IUN	5.11	24.60	-1.12
IUM	2.51	16.95	-1.92
IUC	0.69	-36.19	-2.03
IRN	-5.23	7.80	-2.54
IRM	-1.27	14.06	-1.88
IRC	0.21	35.43	-1.86

Source: CGE Model Simulations

Table 27: 2011 Social Accounting Matrix (SAM) for Nigeria

	CRP	OAG	COM	MAN	UTS	CRP	OAG	COM	MAN	UTS	LAB	CAP	HH	GOVT	INDTX	IMTAX	SUBS	CAPITAL A/C	ROW	TOTAL
CRP						7150.234													6683.894	**13834.13**
OAG							1900.352												108.0836	**2008.436**
COM								2097.622											14986.11	**17083.73**
MAN									6272.066										79.46327	**6351.529**
UTS										19404.38									116.6256	**19521**
CRP	2715.913	0	0	774.3454	23.5535								2467.933	38.00774				1336.478		**7356.229**
OAG	0	0	0	680.4464	58.18528								1202.075	16.67006				42.39796		**1999.774**
COM	0	7.413392	347.8603	246.8562	1153.486								121.8103	73.62517				263.5315		**2214.582**
MAN	711.0637	751.8677	252.7939	1925.184	2015.898								1087.125	951.3327				246.7597		**7942.025**
UTS	118.0151	409.3505	842.2776	2427.976	6032.931								10134.68	1578.716				1689.85		**23233.8**
LAB	3224.55	247.5299	5416.999	32.25411	3539.436															**12460.77**
CAP	6935.277	581.8217	9880.859	67.97128	6300.299															**23766.23**
HH											12460.77	23766.23								**36227**
GOVT															177.2981	324.1171	-15.8596			**485.5556**
INDTX	0.595644	8.969088	13.53258	73.47655	80.72424															**177.2981**
IMTAX	1.846197	0.117842	6.089101	3.200832	6.654205	10.33304	6.888691	5.408369	114.8978	168.681										**324.1171**
SUBSIDY	-13.4663	0	0	0	-2.3933															**-15.8596**
CAPITAL A/C	42.18001	1.294108	60.78032	9.885426	118.3657								21213.37	-2172.8					-15694.1	**3579.017**
ROW	98.1538	0.071257	262.536	109.934	193.8608	195.6625	92.53374	111.5516	1555.061	3660.74										**6280.105**
TOTAL	**13834.13**	**2008.436**	**17083.73**	**6351.529**	**19521**	**7356.229**	**1999.774**	**2214.582**	**7942.025**	**23233.8**	**12460.77**	**23766.23**	**36227**	**485.5556**	**177.2981**	**324.1171**	**-15.8596**	**3579.017**	**6280.105**	

Source: Author's Computations from NISER 2011 I-O Table