

Minimum Wage and the Working Poor in Nigeria: Is there a Link?

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Abstract

The International Labour Organization (ILO) constitution of 1919 emphasized the provision of an adequate living wage as a major improvement in the labour market conditions (Starr, 1981). This was re-affirmed by the ILO 1944 Philadelphia Declaration, where it was reiterated that countries should adopt a minimum living wage to protect the poor employed workers. In the last two decades, the effectiveness of the minimum wage as a poverty-reducing tool has come under intense criticism. It was observed that a weak link exists between poverty and minimum wage.

In Nigeria, the minimum wage is more of a political tool, as demonstrated in the past decades. The consequence of this is that, it is not indexed to price changes, thus nominal minimum wage changes does not keep trail of price changes. Anecdotal evidences also reveal that retrenchments of workforce are associated with wage increases. Existing studies on the minimum wage focus substantially on developed countries and such findings may not be generalised to developing countries due to large variations in both labour market structures.

This study filled this gap by examining the link between the minimum wage policy in Nigeria and the poverty status of its intended beneficiaries between 1980 and 2010, using a rich household survey data. The findings show that, although the minimum wage is targeted at the poor-working group, the link is not strong. More importantly, the minimum wage policy in Nigeria increased poverty incidence within the observation period. One plausible explanation for this is the sharp decline in the real minimum wage overtime. This may have resulted in decline in the purchasing power of minimum wage workers. The result further show that high unemployment rate increased poverty incidence. Additional years of schooling and advancement in age reduced poverty rate among low wage earners.

It is therefore important that welfare policies that closely target minimum wage workers should complement the minimum wage policy. In addition, gradual and periodic adjustments of the minimum wage to the consumer price index are necessary in the country, as it will help preserve the worth of the wages earned by the poor workers. Similarly, the government at the centre should desist from the practice of unilaterally setting the minimum wage. Autonomy should be given to state governments to determine the minimum wage according to their financial strength.

1. Introduction

The International Labour Organization (ILO) constitution of 1919 emphasized the provision of an adequate living wage as a major improvement in the labour market conditions (Starr, 1981). This was re-affirmed by the ILO 1944 Philadelphia Declaration, where it was reiterated that countries should adopt a minimum living wage to protect the poor employed workers.

Since then, the minimum wage had been used as a political, economic, and social tool. The minimum wage as a political instrument is clearly exhibited in developing countries where incumbent governments grant wage increases to unskilled workers or include wage increase as a party manifesto in order to gain the support of the electorates.¹ The economic and social elements of minimum wage which emphasized productivity, ability to pay, and proper indexation to price changes have however not featured prominently in the minimum wage setting in Nigeria. Irrespective of the motive underlying minimum wage determination, the efficacy of the minimum wage as an anti-poverty tool has come under considerable criticism over the years. The pro-poor effects of the minimum wage have been contested on the grounds that increasing number of beneficiaries of minimum wage are secondary workers and belong to non-poor households.²

This weak link between the minimum wage and poverty was first emphasized in Stigler's (1946) seminal article where he offered answers to questions on the relevance of the minimum wage in fighting poverty. In this theoretical paper, his opinion was that since no close correlation exists between hourly wage levels and family income, and since family income and needs are the fundamental factors in the problem of poverty, then it implies that minimum wage is a poor tool in reducing poverty. He concluded therefore that for minimum wage to have the desired positive impact on poverty, it must vary with employment level, family size, number of earners, non-wage income and other factors.

This stance has been corroborated by several authors such as Gramlich (1976), Browning and Johnson (1983), Burkhauser and Finegan (1989), Manning and Bird (2005), Neumark et al (2005) and Sabia and Burkhauser (2010). These studies which are based on different countries found a fragile or no link between the minimum wage and workers' welfare. Two important reasons given for this disconnect are the resulting high unemployment arising from the minimum wage, and the fact that poor households do not have a significant number of workers who are beneficiaries of the minimum wage. It is also noteworthy to point out that some studies have also established that minimum wage has poverty reducing effects.³ Can these findings be generalised to Nigeria? There are evidences of massive retrenchments arising from minimum wage increases in Nigeria. This has also been buttressed by few available studies on the minimum wage in the country.⁴ This has the tendency of pushing

¹ This has largely dominated minimum wage setting in Nigeria. Governments that have used this approach include Shehu Shagari in 1981, Obasanjo in 2000, and Goodluck Jonathan in 2011.

² See Gramlich (1976), Browning and Johnson (1983), Burkhauser and Finegan (1989), and Manning and Bird (2005) for explicit discussion on this.

³ Some of them are Mincy (1990) and Addison and Blackburn (1999).

⁴ See Aderemi (2014) for an explicit review of these studies.

workers into poverty. Since the minimum wage increases the wages of those who retain their jobs and reduces the benefits of those who lose their jobs, the effect on poverty in Nigeria could be ambiguous.

The pertinent research questions are: is there a link between the minimum wage and the working poor in Nigeria? Does the minimum wage, reduces or increases poverty incidence among its beneficiaries? Providing answers to these questions is important as it may assist in redirecting government policies to better target the working poor if need-be. In addressing these questions, the research is divided into two parts. The first part tracks changes in the characteristics and household incomes of low-wage earners whom minimum wage is meant to benefit using National Consumer Surveys for 1980, 1985, 1992, 1996 and Nigerian Living Standard surveys for 2004 and 2010, following Burkhauser and Finegan (1989). This was necessary in order to determine the existence or not of a link between the working poor and the minimum wage. The second part involves a panel regression approach using the surveys, following the work of Addison and Blackburn (1999). This introductory part is followed by section two which provides brief theoretical, empirical and methodological review. Section three describes the data and tracks the characteristics of minimum wage beneficiaries using the surveys. Section four presents the empirical analysis and discussions, while section five concludes and highlights policy suggestions.

2. Theoretical, Empirical and Methodological Review

Theoretical Considerations

Stigler's seminal article in 1946 on minimum wage, eight years after the Fair Labour Standard Act of 1938⁵ was instituted offered some answers to questions about the relevance of a minimum wage in fighting poverty. In this theoretical paper, he emphasised the contrasting role of a minimum wage in a competitive labour market and one in which the employer has control over wages. He argues that since in a competitive setting, workers are paid their value of marginal product, an institutionally determined wage above this level will result in unemployment. In a situation where employers determine wages, a higher wage could induce employment. His opinion on the poverty-reducing effect of minimum wage is that since family income and needs are the fundamental factors in the problem of poverty, it implies that minimum wage may be a poor tool in reducing poverty. The prominent theories explaining the labour market outcomes of the minimum wage are briefly reviewed here. The review is premised on a dualistic labour market structure (formal and informal sector), a prominent feature of the Nigerian labour market.⁶

The perfect competitive theory of wage determination has been used to identify the benefits and costs associated with minimum wage legislations. This theory assumes that workers and jobs in the formal and informal sector are homogenous, and that market forces ensure that the wage rates in each sector are equalised. The setting of a minimum wage above the market clearing wage in the formal sector results to a rise in the labour costs and decline in labour demand for formal sector workers. The

⁵ The Fair Labour Standards Act of 1938 is a federal law in the United States, which established the national minimum wage for workers and also putting a cap on the hours an employee can work.

⁶ In Nigeria, employers of labour in the informal sector are not legally binded to pay a minimum wage.

dis-employment effects could worsen in the long run as the demand curve for labour becomes more elastic, and labour is replaced with capital and the less expensive informal sector labour. It is worth noting however that the decline in employment may not fully translate into high unemployment rate. This is because some of the unemployed population will give up their job search and exit the labour market; others could pursue non-work alternatives such as schooling, while some may remain in the labour market by finding alternative employment (either paid-employment or self-employment) in the uncovered informal sector.

Assuming that some fraction of the excess labour supply in the formal sector moves to the informal sector, the supply of labour at the prevailing wage rate in the uncovered informal sector will rise, thus depressing wages of existing workers in this sector, and may reduce their welfare. The fall in the wages also results in an increase in employment in the informal sector. This implies that the effect of a minimum wage on the welfare of workers in the uncovered informal sector could be ambiguous. If wages are downward rigid in the informal sector and assuming that some of the unemployed workers in the formal sector continue to search for jobs in the formal sector, there will be a net increase in unemployment.

Proponents of the monopsony theory hold a contrary view about the labour outcomes of a minimum wage rise. They emphasise that a rise in the minimum wage could result in increased employment. Card and Krueger (1994) marked a turning point about the widely held view that a rise in minimum wage reduces employment. In this model, it is assumed that only firms in the covered formal sector have monopsony power and determine employment level only, while employers in the uncovered informal sector remain competitive. Wages in the formal sector also serve as signals to informal sector wages. The supply of labour is also assumed to be fixed in the short run. The imposition of a minimum wage makes the monopsonist a wage taker and therefore operates at the competitive equilibrium paying a higher wage and also increasing employment.⁷ At this wage level, the monopsonist can employ more workers since wage is now institutionally fixed and he can employ as much labour at the fixed rate without driving up wages. The increase in the supply of labour to the formal sector comes from the informal sector since a fixed endowment of labour supply is assumed in the informal sector. As informal sector workers are attracted to the formal sector, the wage rate is driven up in the former. In this model, we can infer that all initial low wage earners in the formal sector gain (improved welfare), as they all retain their jobs and now have a higher pay. Similarly, informal sector workers that moved into the formal sector also benefit from a higher wage. Lastly, the remaining workers in the informal sector will also have an improved welfare as a result of the increase in the informal sector wage.

The labour market outcomes of the minimum wage under the efficiency wage theory have also dominated the literature. This theory assumes that wage level affects workers' productivity. An efficiency wage is a premium wage over the market average. According to these proponents, a higher minimum wage in form of an efficiency wage leads to higher productivity, either by inducing workers to increase their effort (also prevent them from shirking) or improving their physical strength through improved diet and health. The resultant higher productivity leads to higher

⁷ The monopsonist can afford to increase employment, as long as its marginal revenue product exceeds wages.

employment. In a situation where increases in wages do not stimulate productivity, a higher minimum wage will lead to a decline in employment.

The monopsonistic competitive theory has also been used to explain the labour market effects of a minimum wage policy. This is a combination of the monopsony and competitive labour market model. An economy with a single employer (monopsony) rarely exists in the real world, neither does a pure perfect competitive labour market exist. The assumptions of the perfect competitive labour theory are too restrictive and impractical for a country like Nigeria. The theory that both employers and workers have perfect information about wages and employment opportunities in the labour market seems unrealistic in the Nigerian economy in which the labour market is dualistic, with majority of workers operating in the informal sector. Information about job vacancies is also costly.

Further, skill-homogeneity hardly exists. Workers differ by skill type. In Nigeria, one would expect to find high heterogeneity among labour skills. Similarly, the assumption that firms are wage takers, and that a fall in wage rate by anyone firm will lead to loss of workers to other firms paying the competitive wage rate has been found not to be true. Bhaskar *et al* (2004) argue that workers may not resign immediately following a cut in wages if they must search for new ones. This is because job search involves cost. The search proves more difficult in a country such as Nigeria where there is imperfect information and high unemployment rate. Workers also consider non-wage job characteristics before making decisions to change jobs.⁸

In a monopsonistic competitive labour market, a higher minimum wage has two opposing effects; the employment increasing “oligopsony” effect and the employment reducing “exit” effect. On one hand, a higher minimum wage increases labour force participation rate, inducing increased employment. On the other, a binding minimum wage reduces employers’ profits (through high labour cost) when there is free entry and exit, thus compelling some employers to exit the market. Since firms make zero profits in a monopsonistic competitive market due to competition, increased labour cost may lead to negative profits or loss leading to exit of some firms. The exit of some firms has negative effects on employment. It should be noted that the overall effect of a minimum wage in a monopsonistic competitive labour market depends on which effect dominates.⁹ Hence, a minimum wage set above the market wage could have a positive or negative effect on employment and welfare.

The above review indicates that theoretical predictions of the effect of minimum wage are not clear-cut due to differences in labour market conditions and other factors.

Methodological Review

The literature is replete with empirical techniques for estimating the effects of a minimum wage increase. No consensus is reached on the most appropriate method, as they all have their drawbacks. However, their benefits and appropriateness outweighs one another, thus necessitating the use of a particular method. Although

⁸ Non- wage job features include job specification, hours of work, job satisfaction, and distance of the firm from the worker’s place.

⁹ Either employment reducing “exit” effect or oligopsony employment increasing effect.

the potential distributional consequences of the minimum wage have long been noted (Stigler, 1946), they have received comparatively less attention and there is no established consensus on the empirical strategy for estimating these effects (Dinardo *et al.*, 1996). The fundamental methodologies widely used in the minimum wage literature are elucidated upon here. These methods are either grouped under the partial equilibrium or the applied/general equilibrium approach. They include; simulation, conventional regression, non-parametric regression and the computable general equilibrium (CGE) methods.

The simulation method involves the use of the information provided by a nationally representative household survey data to identify low wage earners (potential beneficiaries of a minimum wage) and simulating their additional earnings from a minimum wage increase based on various assumptions. This simulation approach differs from the CGE simulation in that, while the former uses the income or expenditure survey or the labour force survey as the database, the database for the latter is the Social Accounting Matrix. Earlier studies (Browning and Johnson, 1983) and (Mincy, 1990) focused on simulation methods in appraising the distributional and efficiency effects of a minimum wage rise. Other more relatively recent studies which have adopted this method are (Addison and Blackburn, 1999) and (Manning and Bird, 2005).

A major drawback of this method is that it is not a direct estimate of the consequences of minimum wage increases on family income, but rather hinges on contentious and unrealistic assumptions. As a result of these assumptions, simulation method captures only short-term effects of minimum wage changes, because it violates the general equilibrium conditions of price substitutability. Further, simulation results are highly sensitive to the labour demand elasticity chosen. In addition, studies that have used simulation ignored the effect of possible changes in labour supply of other family members on the household income (Addison and Blackburn, 1999). Lastly, they do not capture spillover effects arising from a minimum wage increase.¹⁰ The spillover effects could however impact on welfare and income distribution pattern.

Another method that has been widely used is the traditional regression method or the parametric regression approach. This method involves using time-series, cross-sectional or panel data, and regressing poverty or income inequality measures on the minimum wage data and some control variables. The gross national product (GNP) or unemployment rate is often used to control for business cycle conditions and its effect on welfare. Studies that have adopted this approach include (Bell, 1997), (Addison and Blackburn, 1999) and (Golan *et al.*, 2001). The advantage of this technique is that it uses actual changes in the poverty measure and the minimum wage in estimating poverty effects of the minimum wage.

The major limitation of this approach as noted by Alatas and Cameron (2008) is that since the minimum wage variable is expressed as the ratio of minimum wage to average wage, it is often difficult to separate the impact of the variation in minimum wage from the impact of average wages. They also emphasised the limitation of omitted control variables. Controlling for observable and unobservable variables that have effects on poverty rate and income distribution besides minimum wage may also

¹⁰ For example, see Browning and Johnson 1983.

present challenges. Another major shortcoming of this method as pointed out by Lemos (2004) is the often missing connection between the empirical models of studies adopting this approach and theoretical underpinnings.

Studies on the poverty and income dispersion effects of a minimum wage rise have also exploited the non-parametric and semi-parametric regression methods.¹¹ In this approach, the relationship between poverty measures and minimum wage is not restricted by the model to follow any specific functional form. Historical data determines the appropriate functional form. This eliminates the problem of functional form misspecification usually encountered in the traditional regression method (parametric). Another advantage over the conventional regression method is that the response coefficient is allowed to vary from observation to observation, which relaxes the assumption of fixed coefficients associated with traditional regression method. It allows for regression of welfare measures on the minimum wage earned by different quantiles of the income group. Nevertheless, it is worth pointing out that the method is not without its inadequacies which include the inability to fully exploit continuous variation in the minimum wage (Neumark *et al.*, 2005).

All the methods discussed so far are partial equilibrium approaches; they only capture the direct effects of minimum wage increases. Meanwhile, in reality, minimum wage generates indirect effects, which affects other factors used in the production process, relative prices, and labour in the informal sector (non-beneficiaries of a minimum wage). Accounting for all these is therefore germane in a minimum wage study. The computable general equilibrium (CGE) method is most widely used among the general equilibrium methods, and has gained prominence in investigating the welfare/poverty and income distribution effects of a minimum wage. One probable reason for this is its rich database; the social accounting matrix (SAM), which provides a comprehensive and detailed framework for systematic recording of transaction flows in an economy.

Some of the studies that have adopted this method in examining the impact of minimum wage legislations are Hinnosaar (2004), Taiwo *et al.* (2005), Folawewo (2009) and Aderemi (2014). The use of the CGE approach in examining the effect of policy changes (such as the minimum wage) on the economy is becoming widespread due to its ability to isolate just the minimum wage shock and examine the impact of the shock across the entire economy. However, critiques of this method point to its black-box nature, high sensitivity to chosen elasticity, and static data as its major weaknesses.

Empirical Literature

Studies on the effects of a minimum wage policy on macro and micro economic indicators dominate the literature. While a significant number of them focused on the developed countries, a few studies exist for developing countries. In Nigeria, in particular, a handful of literature exists despite the relevance of this topic to welfare. Empirical results of the effects of minimum wage increases on poverty and income

¹¹ See Dinardo *et al.* (1996); Flinn (2002); and Neumark *et al.* (2005).

inequality in developed and developing countries are mixed, while some are inconclusive.

Gramlich (1976) observed a weak relationship between poverty incidence and the minimum wage in his study based on the United States population survey for 1973 and 1975. Investigating the impact of the 25 per cent increase in the minimum wage from \$1.60 to \$2.00 per hour in 1974, he found a fragile link between wages and family income, implying that minimum wage may not have strong redistributive effects. The results further revealed that only about 7 and 10 per cent of low wage-teenagers (minimum wage beneficiaries) and high-wage teenagers are in low-income families respectively, while 40 per cent of low-wage teenagers are in high-income families. This meant that the spill-over of benefits into high income families reduced the efficiency of the minimum wage as an effective redistributive tool. He concluded that for every billion dollars that a rise in the minimum wage accrues to low-wage workers, only about \$350 million goes to low-income households.

Similarly, Browning and Johnson's (1983) paper which found that losses accrued to low income households following a simulated wage increase were hinged on the fact that only a small fraction of beneficiaries of the minimum wage belong to low income households. Also, Burkhauser and Finegan (1989) simulated the poverty effects of the proposed 1988 Kennedy-Hawkin Bill which was to increase the minimum wage in the United States from \$3.35 to \$5.05 per hour. The study used census data for 1950, 1960, 1970, 1980, and 1985 to identify potential minimum wage beneficiaries. The survey data revealed an increasing shift over the years in the fraction of low wage earners in high income families. Their findings are that the wage bill from the proposed increase in minimum wage was about \$7billion. And out of this amount, only \$800million goes to poor families, since the share of low wage earners in poor households was only 11 per cent. About \$2.8billion is however disbursed to families with income three times above the poverty line.

Manning and Bird (2005) also concluded that minimum wage legislations are not an effective target anti-poverty tool in Indonesia. It was found that only about 17% of the additional earnings from the minimum wage increase in 2003 flow to poor households, 34% of the benefits flow to the near-poor, while half of the benefits accrued to non-poor households. Moreover, the examination of net benefits reveals that only one in four poor households gain through higher incomes, while three out of four poor households lose through higher prices. Muller and Steiner (2008) analyzed the poverty effects of the proposed €7.50 per hour increase in the minimum wage in Germany. According to them, the rationale for the increase was to prevent poverty among the working poor. Their results showed that the policy would be ineffective in reducing poverty.

More recently, Sabia and Burkhauser (2010) extended the literature by examining the poverty effects of the increase in the states and federal minimum wage rates in the United States from \$5.15 per hour in 2003 to \$5.85 per hour in 2007 using a survey data and employing a panel regression. They went further to simulate the distributional effect of the then proposed increase in the minimum wage from \$7.25 per hour to in 2009 to \$9.50 per hour also using a population survey. Their findings showed no evidence that minimum wage increases between 2003 and 2007 reduced poverty rate. They also found that the proposed wage increase did not appropriately target the working poor, as only 11.3 per cent of workers who will benefit from the

proposed wage increase lived in poor households. About 63.2 per cent of beneficiaries of minimum wage are secondary workers residing in households with income twice the poverty line, while 42.3 per cent of the beneficiaries lived in families with incomes three times the poverty line. It is noteworthy to point out that some studies have also established that minimum wage has poverty reducing effects.¹²

In Nigeria, the few studies which have studied the effect of the minimum wage focused on its employment and macroeconomic effects. Their result are also mixed, with Taiwo et al (2005) finding a dis-employment effect, while Folawewo (2009) emphasised that the welfare of both low and high income households increased following minimum wage increase in Nigeria. They both adopted the CGE method. It is obvious that studies in Nigeria have neglected the poverty effects of the minimum wage; the sole motive of minimum wage policies. The high and rising poverty incidence in the nation despite series of minimum wage increases since 1981 further calls for investigation of the impact of the welfare policy. Does a strong relationship exist between the minimum wage and the working poor? The next section investigates this link.

3. Profile of Low Wage Earners and Households' Poverty in Nigeria

Data Description

The data used in this study draws from the rich Nigerian National Consumer (NCS) Surveys of 1980/81, 1985/86, 1992/93, and 1996/97; and the Nigerian Living Standards Surveys (NLSS) of 2003/04 and 2008/2009. These surveys involved a sample of enumeration areas selected in each state which is a representative of both the urban and rural areas. In the 1981, 1986, 1993, and 1997 surveys, 11,110; 9,317; 9,697; and 14,951 households were surveyed respectively. The 2004 and 2009 surveys were individual and household-based, and contain more detailed information on respondents' labour and other demographic characteristics.¹³ The 2004 survey covered 19,158 households and 92,610 individuals, while the 2009 survey had 73,329 households and 332, 938 individuals. The sampling techniques used in the surveys are based on a two stage stratified sampling design, thus allowing for appropriate comparism among the surveys.¹⁴

In constructing the profile of low wage workers who are historical beneficiaries of the minimum wage, full time employees in the private and public sectors, aged 15-65 years are selected.¹⁵ Similarly, we excluded workers in the informal sector as they are not legally covered by the Nigerian minimum wage law. Only Firms with fifty or more employees are legally binding to pay the minimum wage in Nigeria. This was also taken into consideration in selecting low wage earners.

¹² They include Mincy (1990) and Addison and Blackburn (1999).

¹³ Labour characteristics such as hours worked, occupation, industry of employment etc are captured in the survey.

¹⁴ The first stage involved delineation of states into enumeration areas (EAs), while in the second stage, housing units were chosen from the EAs.

¹⁵ The working age group in the country is 15-65 years. According to the Minimum Wage Act of 1981, the minimum wage only applies to full-time workers working at least 40 hours per week.

Table 1 shows the distribution of household heads by poverty incidence in Nigeria between 1981 and 2009. The National Bureau of Statistics (NBS) poverty line was adopted in constructing poverty incidences for the household heads. This poverty measurement is relative and uses one-third of mean per capita expenditure as the poverty line.¹⁶ It is a regular practice for respondents to understate their income during surveys in Nigeria, thus expenditure is used as a proxy for actual income. One major advantage of this poverty measure is that it adjusts for household sizes. This is in harmony with Burkhauser and Finegan (1989). In selecting low wage earners, educational attainment of household members is used. Historically, the minimum wage in Nigeria applies to poorly educated workers with educational qualifications below the tertiary level or equivalent.¹⁷

Table 1. Distribution of Households headed by a low wage worker (%)

	1981 Survey	1986 Survey	1993 Survey	1997 Survey	2004 Survey	2009 Survey
Actual distribution						
Less than						
1.00(poor)	77.4	11.9	19.6	42.1	67.3	86.8
1.00-1.99	15.9	25.3	29.7	29.9	17.1	8
2.00-2.99	3.9	20	17.5	12.8	4.7	2
3.00 or above	2.8	42.8	33.2	15.2	10.9	3.2
Total	100	100	100	100	100	100

Another point worth mentioning is that the sampling procedure adopted in all the surveys is uniform (two-stage stratified sampling), thus enabling a trend comparison of household profile over the years.

It is clear from Table 1 that the distribution of low wage headed households who are poor increased from 77.4% in 1981 to 86.8% in 2009. One would however observe the pattern in the distribution. It declined to 11.9% and increased through 2009. This shows that a significant number of households headed by a low wage earner are poor. For low wage headed households above the poverty line, the pattern is different. In 1981, low wage household heads who are three times above the poverty line are 2.8%. This increased to 42.8% in 1986, and declined thereafter. This trend is mirrored by households who live just above the poverty line and two times above the poverty line. The general message is that, from 1986 one would observe a significant and steady rise in the number of poor low wage headed households, while the number of non-poor low wage headed households declined. The decline in the number of the non-poor workers is more prominent among households with their income twice and three times above the poverty line. This suggests that over the years, larger number of low wage headed households transited into poverty.

Table 2 shows the distribution of all low wage workers in 2004 and 2009. Analysis is limited to these two surveys because the 1981 to 1996 surveys do not provide explicit data on household members.

¹⁶ Mascella et al (2009) also used a relative poverty line in profiling the low wage earners in Ontario. The poverty line adopted was 50% of median level of income

¹⁷ This however depends on other factors highlighted earlier such as being a full-time workers, etc.

Table 2. Distribution of all low wage workers aged 15-65 (%)

	2004 Survey	2009 Survey
1) Actual distribution		
Less than 1.00(poor)	57.8	80.7
1.00-1.99	20.7	13.5
2.00-2.99	6.8	3.7
3.00 or above	14.7	2.2
Total	100	100
2) Percentage of all low wage workers who were		
a) Heads of households	80.8	71.1
b) Heads of poor households	51.1	62.7

Similarly, the percentage of low wage workers in poverty increased between 2004 and 2009 from 57.8% to 80.7%, while the percentage of low wage workers above the poverty line declined. This further supports the trend observed in Table 1 and indicates a significant rise in the entry of low wage workers into poverty over the years. The lower panel of Table 2 also shows that in 2004, 80.8% of all low wage workers were heads of households. This declined to 71.1% in 2009. The implication of this is that household heads dominate low wage workers, thus a minimum wage policy that is binding, with a high level of compliance will benefit households rather than individual workers. In addition, 51.1% and 62.7% of all low wage workers are heads of poor households in 2004 and 2009, respectively. This statistics therefore supports the existence of a link between the minimum wage and poor workers in Nigeria, although it is not a strong one (average of 56% of minimum wage workers are heads of poor households).

Generally, it can be argued that beneficiaries of the minimum wage in Nigeria in 2004 and 2009 are mostly primary workers (household heads) and also reside in poor households. This outcome differs from the findings of Gramlich (1976), Browning and Johnson (1983), and Manning and Bird (2005) that in the United States, minimum wage workers are dominated by secondary workers.

An intuitive explanation for this is that in Nigeria, part-time workers are not entitled to the minimum wage. However, students and women who largely constitute secondary workers would rather work part-time. Hence, they are screened out of the minimum wage coverage. In contrast, in the United States, women and students are allowed to work part-time and earn the minimum wage.

In the appendix, the demographic features of poor and non-poor households headed by low wage workers between 1981 and 2009 are presented to give more insights on the poverty status of the households. Characteristics of low wage earners below the poverty line are compared with low wage earners with per capita expenditure that is three times above the poverty line. It is clear from Tables 3 to 8, that in all the survey years, non-poor low wage earners are more educated than poor low wage earners. For instance in 1996 as shown in Table 6, 43.8% and 28.3% of poor household headed low wage earners had no education and secondary school education,

respectively. For non-poor wage households, only 22.9% had no education, while almost one-half (42.2%) of them had secondary school education. Since higher educational attainment is positively correlated to higher earnings, then one would expect an improved welfare for the more educated households.

Similarly, poor households have larger family size than non-poor households as shown in all the survey years. In 1981, family size of between 4 and 10 constitute about 47.4% and 2%, respectively of poor and non-poor households. In 2004, it was 73.5% and 21.3% in the same order. Observable from Table 7 is that the education of parents plays a significant role in the educational attainment and welfare of their children. Only 16.1% of poor low wage households' fathers had secondary education, compared to 21.4% for non-poor low wage households' fathers. Another interesting fact is that no low wage headed household (poor and non-poor) had a father whose education went beyond a secondary school. In addition, low wage headed households are dominated by those in their prime age, (age 26-47).¹⁸

As pointed out by Burkhauser and Finegan (1989), the poverty status of minimum wage workers depends largely on the hours worked, family size and how much other family members earn. This was earlier noted by Stigler (1946), when he asserted that for minimum wage to have the desired positive impact on poverty, it must vary with employment level, family size and number of earners in the household.

The demographic characteristics of low wage headed households in Nigeria as presented earlier supports some of these facts. In the context of Nigeria, it is not surprising that despite upward minimum wage reviews since 1981, poverty incidence among households headed by low wage earners is high and rising.¹⁹ This may be attributed to the following reasons. We can infer from Table 2 that although secondary low wage earners in households headed by low wage earners increased between 2004 and 2009, they are still small in size (average of about 25%). This suggests that most household members depend heavily on the head (primary worker) for survival. In addition, the minimum wage in Nigeria is arbitrarily fixed and not indexed to living costs. And as a result, the real value of the minimum wage declines despite increase in the nominal wage, thus reducing the purchasing power of wage earners. For instance between 1982 and 1988 there was a freeze on wages, despite the continuous rise in the price level.

Adjustments in the minimum wage have also been delayed and accompanied by large increases. The average period for minimum wage increases in Nigeria is about five years interval, compared to yearly review in some countries. Delay in the review of wages and non-indexation to living costs could result in a situation where growth in wages trail growth of price indexes. Evidences have also shown that minimum wage increases in Nigeria may be associated with job losses (Anyanwu, 2004). While some workers benefit from high wages, other lose their jobs and become worse-off. This may increase poverty incidence.

¹⁸ This is not shown in the tables.

¹⁹ From 1981 to date, the minimum wage had been reviewed upward six times.

4. Empirical Analysis and Discussion

Econometric studies on the impact of the minimum wage on income distribution or poverty have adopted the model of the type below.²⁰

$$P_{st} = \delta_s + \alpha_t + \beta \log(MW_{st}) + \theta X_{st} + \varepsilon_{st} \text{-----}1$$

P_{st} represents the poverty of households headed by low wage earners in state s and year t . The poverty variable measures the percentage of the population in poverty in respective states and also adjusts for household size.

δ and α denote state and time-specific intercepts. The state effects adjust for improved labour market conditions in some states and its influence on the poverty measure, while the time effects control for country-wide recessionary effect (Addison and Blackburn, 1999).

MW is the minimum wage variable which adjusted for changes in the price level and in real terms. This is important particularly in Nigeria where the real wage has declined significantly over the years as shown in Figure 1. The variable is in naira per month. The real minimum wage varies across the states due to differences in the general price level.

X is the vector of characteristics of the independent variable (households headed by low wage earners) and includes average age, years of education, gender, and location (urban or rural). Following Addison and Blackburn (1999) and Golan et al (2001), the potential variations in business cycle effects across states were controlled-for using individual state unemployment rates.²¹ Since the surveys are conducted from the midyear of a particular year to the mid-year of the following year, the average unemployment rate for the two periods was used.

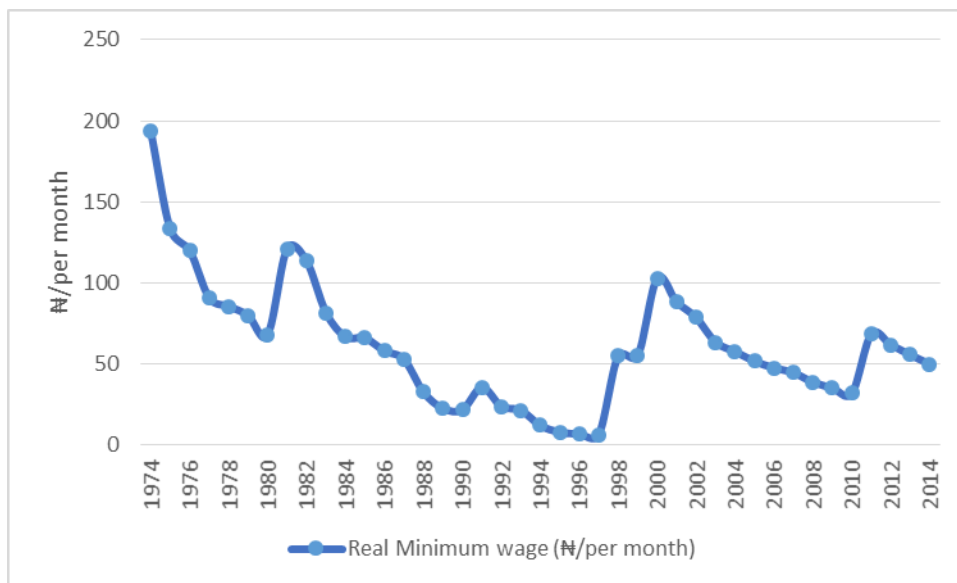
Some data issues are worth clarifying here. The number of states used in the study is nineteen, although Nigeria currently has thirty six states. The rationale for using nineteen states as the base number, which is the old state classification as at 1981 is due to different states observed in the survey years. For instance, in 1981 and 1985 there were nineteen states. In 1992, it increased to 21 states with the Federal Capital Territory, Abuja, while it was 30 states in 1996. In 2004 and 2009, the number of states remained at thirty six. In order to avoid the problems associated with a small sample size and also have a uniform number of states, the states in 1992, 1996, 2004 and 2009 surveys were compressed to nineteen states which existed in 1981.²² The total sample size is 114.

²⁰ See Addison and Blackburn (1999) and Golan et al (2001) for some of these model specifications.

²¹ Some studies use Gross Domestic Product. Since the GDP is not available by state in Nigeria, the unemployment rate proved more appropriate.

²² Classification by the six geo-political zones in the country would have solved this problem. It would however reduce the sample size significantly, with N=6, T=6. All other states were created out of the existing states in 1981, hence it was easy merging into 19 states.

Figure1. Trend of Real Minimum Wage in Nigeria (1974-2014)



4.1 Model Results

Table 9 reports the result of the fixed effects²³ estimates of the poverty effects of minimum wage in Nigeria. Columns 1 and 2 present different specifications of the model. Results in column 1 did not control for business cycles among the states. The model has a good overall fit as shown by the F-statistic, which is statistically significant at 5%. A higher minimum wage in the observation period increased poverty incidence among minimum wage workers as shown by the results. A one naira increase in the real minimum wage increases poverty rate by 0.4%. Low wage earners who are men are less poor than women, and living in the rural area reduces the probability of being poor. Education and age of workers are not statistically significant in influencing their poverty status.

In specification 2, the state specific control (unemployment rate) is included as an independent variable in the model as shown in Table 9. The coefficient of the unemployment rate is positive and statistically significant at 5%, implying that a high jobless rate increases poverty incidence among low wage workers. In addition, the coefficient of the minimum wage is still positive and statistically significant, although it reduced in magnitude.

²³ Hausman Test was conducted to choose the more appropriate estimation technique between Fixed and Random effects. This result is not reported here due to space constraint, but it is available upon request.

Table 9. Fixed Effects Estimates of Poverty Effects of Minimum Wage

Independent Variable	Specification	
	[1]	[2]
Level of Real Minimum Wage	0.4494*** [0.0922]	0.3485*** [0.1038]
Unemployment Rate	- -	1.0343** [0.5171]
Gender	0.569* [0.2935]	0.5812** [0.2888]
Location	-0.505*** [0.1672]	-0.488*** [0.1647]
Education(years)	1.8348 [1.1708]	0.5666 [1.3147]
Age	1.309 [1.0379]	1.0971 [1.0265]
R-squared	0.31	0.34
F-stat.	1.81	1.96
Prob.(F-stat)	0.0244	0.0119

***, **, * indicate statistical significance at 1%, 5% and 10%, respectively

The number of observation is 114 (19 states observed in 6 years)

Standard Errors are in parenthesis

Gender and location are interpreted as percentage of male and urban dwellers, respectively

Studies combining individuals or states/countries with different characteristics may lead to variations in the error term. Non-constant error terms/heteroscedasticity may bias the standard errors, leading to misleading results. Table 10 therefore provides results of the Wald heteroscedasticity test. The results reject the presence of a non-uniform error variance in the model.

Table10. Heteroscedasticity Test

Wald Group Wise Test

Null: Homoscedasticity

Chi-square (19) =12.627

P-value= 0.8570

Source: Author's estimation

The results presented in Table 9 were subjected to sensitivity tests based on the estimation technique to check its robustness. As shown in Table 11, equation 1 is estimated using Pooled OLS method. The result obtained is similar to the fixed-effects results presented in Table 3. Minimum wage increases poverty incidence and the effect declines with the inclusion of a business cycle control (i.e. unemployment rate). Gender and location are also statistically significant. Surprisingly, the result in

specification 1 shows that higher education increases poverty incidence. The result shown in specification 2 of Table 11 show that the result presented in Table 9 is not sensitive to estimation technique.

Table 11. Pooled OLS Estimates of Poverty Effects of Minimum Wage

Independent Variable	Specification	
	[1]	[2]
Level of Real Minimum Wage	0.4269*** [0.0862]	0.3724*** [0.0964]
Unemployment Rate	- -	0.5508 [0.4414]
Gender	0.5703** [0.2446]	0.5594** [0.2441]
Location	-0.3665 [0.1371]	-0.3382** [0.1386]
Education(years)	2.1385** [1.0406]	1.5069 [1.1548]
Age	1.2629 [0.8313]	1.2168 [0.8300]
R-squared	0.26	0.27
F-stat.	7.817	6.807
Prob.(F-stat)	0.000003	0.000004

***, **, * indicate statistical significance at 1%, 5% and 10%, respectively

The number of observation is 114 (19 states observed in 6 years)

Standard Errors are in parenthesis

Gender and location are interpreted as percentage of male and urban dwellers, respectively

In Nigeria, the aggregate real minimum wage declined by about 70% within the survey period (1981-2009).²⁴ Disaggregating the sample period into 1981-1997 (4 surveys) and 2004-2009 (2 surveys) shows that the real minimum wage declined by 95% and 44% in the former and latter periods, respectively. One major factor explaining the significant decline in the worth of the minimum wage in the 1981-1997 periods is the wage freeze in the 1980s and astronomic rise in the price level that accompanied the Structural Adjustment Programme (SAP). Since variations in the levels of real minimum wage could affect the poverty status of wage earners differently, it is important to examine this effect using the two sub-samples. Similarly, starting from 1998, the country had significant increases in the minimum wage, thus using this period as a break point to test the effect of declining real minimum wage is important.

Addison and Blackburn (1990) also stressed the importance of sample choice in estimating minimum wage effects. The result of the fixed effects estimation using the period 1981 to 1997 is presented in Table 12.

²⁴ In the estimation of the model, States' real minimum wages were used to account for differences in the price level.

Table 12. Fixed Effects Estimates of Poverty Effects of Minimum Wage (1981-1997)

Independent Variable	Specification					
	[1]	[2]	[3]	[4]	[5]	[6]
Level of Real Minimum Wage	-0.0766 [0.1292]	0.0824 [0.1316]	-	-	-	-
Log of Real Minimum Wage	-	-	-11.90*** [3.7393]	-8.4048** [4.1726]	-0.5455*** [0.1363]	-0.4555*** [0.1543]
Unemployment Rate	-	-2.268*** [0.7598]	-	-1.3415* [0.7638]	-	-0.0344 [0.0282]
Gender	-0.1233 [0.3136]	-0.3848 [0.3050]	-0.1575 [0.2851]	-0.3288 [0.2961]	-0.0021 [0.0103]	-0.0065 [0.0109]
Location	-0.5871*** [0.2098]	-0.4837** [0.1985]	-0.3361* [0.1999]	-0.3017 [0.1970]	-0.012 [0.0072]	-0.0111 [0.0072]
Education(years)	-11.018*** [2.0992]	-10.471*** [1.9641]	-12.44*** [1.5400]	-12.530*** [1.5108]	-0.3632*** [0.0561]	-0.3653*** [0.0559]
Age	-5.537*** [1.8179]	-4.697*** [1.7167]	-7.24*** [1.5692]	-6.797*** [1.5592]	-0.2575*** [0.0571]	-0.2461*** [0.0576]
R-squared	0.57	0.63	0.64	0.66	0.57	0.58
F-stat.	3.068	3.76	4.064	4.179	3.04	3.01
Prob.(F-stat)	0.000408	0.000035	0.00014	0.000009	0.000439	0.00472

***, **, * indicate statistical significance at 1%, 5% and 10%, respectively

The number of observation is 76 (19 states observed in 4 years)

Standard Errors are in parenthesis

Gender and location are interpreted as percentage of male and urban dwellers, respectively

The result is presented in six specifications. Generally, the results have a good overall fit. Specifications 1 and 2 present the results using levels of poverty and minimum wage. Specification 2 includes unemployment rate as a control for business cycle. Specification 1 shows a negative estimated coefficient for the minimum wage variable, indicating that a one naira increase in the minimum wage reduces poverty level by 0.07%. The coefficient is however not statistically significant. Educational attainment and age are statistically significant at 1% and have greater reducing effects on the poverty level.

Specifications 3 and 4 express the real minimum wage variable in logarithmic form, while the poverty variable is in levels. The results in specification 3 show that the minimum wage is statistically significant in reducing poverty incidence. A one per cent increase in the real minimum wage will reduce poverty rate by 0.119%. Location is also statistically significant at 10% and has a negative coefficient, implying that low wage earners in the rural area have a lower poverty incidence. An additional year of schooling reduces poverty level by 12.4%, while advancement in age reduces poverty by 7.2%. The inclusion of unemployment rate in specification 4 reduces the reducing effect of real minimum wage on poverty.

Specifications 5 and 6 both express poverty and minimum wage in logarithmic forms. The real minimum wage variable is statistically significant and indicates that a 1% increase in the real minimum wage will reduce poverty by 0.54%. Similarly, an

additional year of schooling and advancement in age reduces poverty rate by 0.36% and 0.25%, respectively. In this model, unemployment rate did not have a statistically significant effect on the poverty rate as shown in specification 6.

Table 13 shows the results of the estimated model for the sample period 2004 to 2009. Specifications 1 and 2 express the real minimum wage variable in levels. Similar to the first period results, real minimum wage had a reducing effect on poverty rate. A one naira increase in the real minimum wage reduces poverty rate by 0.7%. Years of education also reduces poverty incidence. Unemployment rate is not statistically significant when included in specification 2. Only the real minimum wage variable is significant. Specifications 3 and 4 express the real minimum wage variable in logarithmic form and also suggest that a rising real minimum wage reduce the incidence of poverty.

Table 13. Fixed Effects Estimates of Poverty Effects of Minimum Wage (2004-2009)

Independent Variable	Specification			
	[1]	[2]	[3]	[4]
Level of Real Minimum Wage	-0.709*** [0.1722]	-0.7781** [0.1963]	- -	- -
Log of Real Minimum Wage	- -	- -	-35.722** [8.7225]	-38.88*** [9.923]
Unemployment Rate	- -	-0.5124 [0.6636]	- -	-0.4744 [0.6640]
Gender	0.0653 [0.4393]	0.0975 [0.4477]	0.0747 [0.4396]	0.1071 [0.4498]
Location	0.0737 [0.1529]	0.0478 [0.1587]	0.0751 [0.1534]	0.0511 [0.1597]
Education(years)	-7.2565* [3.6916]	-6.0926 [4.0379]	-7.0596* [3.7095]	-5.9682 [4.0733]
Age	-0.9329 [0.9116]	-1.1818 [0.9796]	-0.888 [0.9161]	-0.4744 [0.6640]
R-squared	0.79	0.80	0.79	0.80
F-stat.	2.427	2.284	2.41	2.25
Prob.(F-stat)	0.04462	0.061	0.0459	0.065

***, **, * indicate statistical significance at 1%, 5% and 10%, respectively

The number of observation is 38 (19 states observed in 2 years)

Standard Errors are in parenthesis

Gender and location are interpreted as percentage of male and urban dwellers, respectively

One should be cautious when interpreting the results in Tables 12 and 13 which show a poverty reducing effect of the real minimum wage. These estimates are based on fixed-effects technique which assumes that heterogeneity among states is stable over the observed sample period. According to Addison and Blackburn (1999), inappropriateness of this assumption could lead to the minimum wage changes picking up differential trends in the labour demand conditions for low wage workers within states. Consequently, this could generate such results presented

above, since fixed-effects estimates of states are more stable over a short period. Following these authors, I relaxed this assumption by including time-trends for each state as controls in the model. The result of the estimate is presented in Table 14.

Table 14. Fixed Effects estimates for sub-samples including year trends

Independent Variable	Specification	
	1981-1987	2004-2009
Level of Real Minimum Wage	-0.4457 [0.6304]	4.595*** [1.4847]
Unemployment Rate	0.2672 [0.4724]	-0.5407 [0.4765]
Gender	-0.1401 [0.1600]	0.3204 [0.3274]
Location	-0.0731 [0.1058]	-0.2031 [0.1331]
Education(years)	-2.0173 [1.2360]	-5.9407* [2.8996]
Age	-0.5771 [0.9955]	-0.1456 [0.7589]

***, **, * indicate statistical significance at 1%, 5% and 10%, respectively

The number of observations is 76 and 38, respectively

Standard Errors are in parenthesis

Gender and location are interpreted as percentage of male and urban dwellers, respectively

The results of the estimation of the fixed-effect regression accommodating for time trends in columns 1 and 2 used the levels of poverty and real minimum wage. The coefficient of the real minimum wage is still negative for the sample period 1981-1987 and not statistically significant. Other specifications²⁵ using logarithm of poverty and real minimum wage makes the coefficient of the real minimum wage statistically insignificant unlike what we observed in Table 12. This weakens the poverty-reducing effect of the minimum wage.

A stronger and more convincing result was obtained for the period 2004-2009 which involved fewer years of observation as the coefficient of the real minimum wage turned positive. This challenged the results obtained in the specification 2 of Table 13.

Some inferences can be drawn from the overall results presented in this study. The first one is that minimum wage in Nigeria increased poverty incidences between 1981 and 2009. This may not be unconnected to the large decline in the purchasing power of minimum wage beneficiaries. The negative impact of high unemployment rates on poverty among states was also emphasized and shown in the findings. Nevertheless, the resulting job losses here cannot be fully attributed to the minimum wage policy.

²⁵ These results are not shown in the paper due to space constraint. Interested readers can request for them from the Author.

The second is that while the overall sample shows that the real minimum wage increased poverty between 1981 and 2009, the sub-samples revealed the contrary. The reasoning behind this is that smaller samples are more vulnerable to the effect of year trends among states which could have overwhelming effects on the minimum wage variable.

5. Conclusion

The topic on the efficacy of the minimum wage policy in improving welfare has generated debates over the years. While this topic has raised a lot of discussions in the developed countries, it has been relatively neglected in the developing countries, particularly Africa (although some work has been done in South-Africa). One reason for this is the widely-held belief that the minimum wage policy is pro-poor. The literature has however shown that the minimum wage policy may be anti-poor due to its poor targeting and unemployment resulting from it. Rising poverty incidence among the poor working group in Nigeria has also raised concerns about the effectiveness of the minimum wage policy, thus necessitating a study like this.

This research traced the historical link between the minimum wage and the working poor in Nigeria using household survey data from 1981 to 2009. The second part examined the effect of minimum wage increases on poverty incidences among the minimum wage beneficiaries using a state-level panel data.

Generally, the findings revealed that the minimum wage in Nigeria is targeted at the poor-working group, although the link is not strong. In addition, the minimum wage policy in Nigeria increased poverty incidence within the observation period. One reason for this is the significant decline in the real minimum wage observed in the country overtime. Evidences have shown that the minimum wage fixing in Nigeria is arbitrary and often-times, the growth of wages trail the growth of price indexes, leading to decline in the purchasing power of minimum wage workers. The study also showed that high unemployment rate increased poverty incidence, although the analysis did not provide information on what proportion of the unemployment rate is attributed to minimum wage increases. Additional years of schooling and advancement in age reduced poverty rate among low wage earners.

Gradual and periodic adjustments of the minimum wage to the consumer price index are necessary in Nigeria, as it will help preserve the worth of the minimum wage earned by the poor workers. Minimum wage is reviewed in Nigeria on average of five years. This often leads to significant increases in the wages, accompanied by rise in the general price level. In the developed countries, it is the practice that minimum wages are indexed to the cost of living and adjusted moderately in line with changes in the consumer price index (CPI). Welfare programmes targeted at minimum wage workers should also complement the minimum wage policy in order to improve their welfare.

Similarly, the government at the centre should desist from the practice of unilaterally setting the minimum wage.²⁶ Some state governments have not been able to pay the current minimum wage on the basis that their revenue cannot support it. Autonomy for states to set the minimum wage according to their financial strength may reduce

²⁶ Although consultations and negotiation are made with the labour unions, the government often-times unilaterally sets the minimum wage.

retrenchments often associated with minimum wage increases in the country.²⁷ Perhaps an interesting area of future research may be to examine which occupational sectors are more vulnerable to minimum wage policies in Nigeria using industry-level data. State governments' efforts should also be directed at promoting improvement in educational outcomes, since higher educational achievement reduces poverty incidence.

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²⁷ See Aderemi (2014) for discussion on the unemployment effects of the minimum wage in Nigeria

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Appendix²⁸

Table 3. Demographics of low wage headed household in 1981(percentage)

	no education	Primary	Secondary	Household size between 4 and 10
Less than 1.00 (poor)	73.8	18.5	7.7	47.4
3.00 or above (non-poor)	69.7	19.7	10.5	2.0

Table 4. Demographics of low wage headed household in 1985(percentage)

	no education	Primary	Secondary	Household size between 4 and 10
Less than 1.00 (poor)	69.6	3.7	26.7	73.5
3.00 or above (non-poor)	54.1	3.3	42.5	25.7

Table 5. Demographics of low wage headed household in 1991(percentage)

	no education	Primary	Secondary	Household size between 4 and 10
Less than 1.00 (poor)	31.1	31.8	37.1	73
3.00 or above (non-poor)	20.8	24.8	54.3	21.3

²⁸ Percentages may not add up to 100 due to rounding off.

Table 6. Demographics of low wage headed household in 1996(percentage)

	no education	Primary	Secondary	Household size between 4 and 10
Less than 1.00 (poor)	43.8	27.9	28.3	70.3
3.00 or above (non-poor)	22.9	34.9	42.2	12.9

Table 7. Demographics of low wage headed household in 2004(percentage)

	no education	Primary	Junior sec.	Senior sec.	Household size between 4 and 10	Father's Education		
						No education	primary	secondary
Less than 1.00 (poor)	4.6	31.0	8.0	56.3	73.5	65.5	18.4	16.1
3.00 or above (non-poor)	0	14.3	7.1	78.6	21.3	57.1	21.4	21.4

Table 8. Demographics of low wage headed household in 2009(percentage)

	no education	Primary	Junior sec.	Senior sec.	Household size between 4 and 10	Employment type		
						Government	International organization	Private
Less than 1.00 (poor)	6.4	24.2	5.5	63.8	69.2	71.9	2.4	25.7

3.00 above (non-poor)	or	19	24.1	3.8	53.2	55.8	74.7	2.5	22.8
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Figure 2. Residual test for Fixed-Effects estimates presented in Table 9

