Efficiency Wage, Rentsharing Theories and Wage Determination in the Manufacturing Sector in Nigeria

By

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Abstract

The Nigerian labour market, like other sectors of the economy, witnessed dramatic changes following the introduction of the structural adjustment programmes (SAPs) in mid 1986. The labour market has a central role to play in the attainment of SAP objectives such as employment, income growth, and poverty reduction.

In 1998 and 2000 the Federal Government implemented two jumbo salary increases which raised minimum salaries in the public sector. This had further implications for wages and employment in the formal sector of the economy. It then becomes necessary to understand the labour market process in the country. This study, focusing on the wage determination process, particularly in the manufacturing sector seeks to do this. Through this, it is possible to answer to the question: "Why would wages not adjust to equate labour supply to labour demand?"

Drawing inspiration from the efficiency wage and related literature, the study uses data from an annual survey of manufacturing establishments conducted by the United Nations Industrial Development Organization in collaboration with the Centre for the Study of African Economies, Oxford, to analyse wage determination process in the manufacturing sector in Nigeria.

Production and earning function approaches were used in the analysis. The ordinary least squares and instrumental two-stage least squares techniques were used in the analysis. Results from the production function analysis show that there is a positive and statistically significant relation between relative wage and productivity, consistent with prediction of the efficiency wage model. Estimation of further augmented production function suggests that some rent-sharing variables such as unionization are also relevant.

Results from analysis of the earnings function show that earnings differentials seem to be explained mainly by human capital, as predicted by the competitive models. Efficiency wage and rent-sharing models both provide additional explanations.

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1. Introduction

The Nigerian labour market has undergone dramatic changes since the introduction of the structural adjustment programmes (SAPs) in mid 1986. The programme started with the civil service reform of 1988 and continued with the downsizing of public sector employment and the liberalization of the banking sector. The banking sector reform resulted in the almost explosive expansion in the number of banks, employment and salaries. SAP led to unprecedented changes in labour market conditions.

In the 1980s, the government mounted a campaign to encourage young graduates from tertiary institutions to become self-employed rather than seek wage employment, particularly public sector employment. The National Directorate of Employment (NDE) was set up in 1987 mainly for this purpose. The programme was aimed at redressing the unemployment problem, particularly youth unemployment that has become almost intractable since early 1980s. Despite the schemes, studies have found that the unemployment problem remains intractable (Oladeji, 1994; Oni, 1994; FOS, 2001).

Persistent unemployment could be due to any of three factors: imperfectly functioning labour market, imperfectly competitive product market or aggregate demand feedback from real wages. Efforts to tackle unemployment should therefore begin with an investigation into its causes before designing programmes and policies. Attempts to identify causes of unemployment in Nigeria have tended to focus on production technology, demographic factors (migration and population growth), and mismatch between output from the education system and the labour market demand (Aigbokhan, 1988, 1992; Oni, 1994). These studies have, however, largely ignored the influence of wages on employment. Such neglect may be due to the widely held view that real wages are generally low in Nigeria (Adebayo, 1999; FOS, 1998), to the extent that it may be concluded that high wages would hardly feature when an employer makes a labour decision.

Simple economic theory suggests that persistent unemployment could only be due to wages being above their market-clearing level. Concerned about unemployment, why were wages not falling to their market-clearing level? This could not be said to be due to minimum wage regulations. Faruqee (1994: 262) noted that "with few exceptions,

the labour market in Nigeria operates without restrictions. The government interferes by setting minimum market wages in nominal terms. Yet the minimum wages have not been binding because market-clearing prices have been higher". Indeed, concerned with growing inventories in their warehouses, operators in the organized private sector (OPS) for much of 1997 and 1998 canvassed upward review of public sector wages. What factors, therefore, drive wages, especially in the private sector? This question is important in the light of the prediction of economic theory that wages could be manipulated to address the problem of unemployment, and also considering the increased role the private sector is expected to play in propelling economic growth.

Much work has been done on SAP and poverty and inequity in Nigeria. Little appears to have been done on the labour market during the era of SAP. Yet such a study is necessary for at least two immediate reasons. First, if we are to understand how to achieve government objectives on employment and labour income generation, it is necessary to understand how the labour market functions. Second, the labour market has an important role in overall government macroeconomic policy. Attaining many of the objectives of such policy depends largely on how the labour market functions; this needs to be better understood. This thus constitutes the research problem addressed in this study.

A feature of the Nigerian economy since the 1980s has been the growing unemployment problem. SAP was meant to reduce, if not eliminate, structural bottlenecks to efficiently functioning labour markets to reduce unemployment. Why this has not been the case is a cause for concern. Are there characteristics of the labour market policies that SAP has not been able to address? This is the objective of this study, focusing in particular on wage determination in the manufacturing sector. Thus, while the broad objective of the study is to examine the determinants of wages and earnings in the manufacturing sector in Nigeria, the specific objectives are to examine whether:

- Factors predicted by efficiency wage theory are relevant to observed earnings differentials; and
- Rent sharing theory is relevant in explaining earnings differentials in Nigeria's manufacturing sector.

The working hypotheses for the study are that:

- Efficiency wage theory provides some explanations for wage differentials in the manufacturing sector; and
- Rent-sharing theory is relevant to understanding wage determination in Nigerian manufacturing sector.

The significance of this study derives from the gap in knowledge it seeks to fill on the role of the private sector in wage determination in Nigeria. There is a large and growing literature on wage structure and determination in Nigeria. The bulk of this literature, however, focuses on public sector wages, with private sector wages being generally assumed to be influenced by the former (Olaloye, 1976; Oladeji, 1994; Adebayo, 1999). This is understandable in the context of Nigeria where periodic public sector wages review commissions have been used since 1946 to determine wage levels and structure. The Adebo Commission 1970 and the Udoji Commission 1974 explicitly recommended that private sector wages should be adjusted accordingly.

Little has been done to understand wage determination in the private sector in Nigeria, and the few studies available do not point to a well-defined direction in wage determination in this sector. For example, Olaloye (1976:147) observes that "in the Nigerian manufacturing industries, the level of labour productivity has been found to exercise a sizeable direct effect on the level of average wage earnings. Also, the level of prices — cost of living index — has been found to have its direct effect on it". In the same vein, Faruqee (1994) observes that the Nigerian labour market largely operates with few restrictions.

These observations seem to suggest that the Nigerian private sector labour market operates in a manner predicted by the competitive market models. However, if this were to be the case, it should be possible for wage flexibility to serve as an instrument for eliminating labour market imbalances, especially as there is evidence of growing unemployment in the economy. For example, Fashoyin et al. (1994) note that the official estimates of unemployment were put at 4.4% in 1980, 10% in 1986 and about 15% in 1992. The unemployment level worsened in the 1990s. The authors further note that "during the period up to the 1970s, unemployment hardly existed among university graduates. However, the structure of unemployment has changed, especially since the 1980s, with an increasing number of university graduates experiencing unemployment. Another group that has become victim of the unemployment problem in the 1980s include skilled and experienced workers who lost jobs as a result of contractions in the economy" (Fashoyin et al, 1994:3). FOS (2001) puts urban unemployment at 7.8% in December 2000, with youth unemployment being 18.4%. Rather than adjust wages downwards in the face of growing unemployment, key operators in the organized private sector actually called for upward review, apparently to shore up aggregate demand.

Thus, it is apparent that there is a gap in our understanding of the wage determination process in the private sector. This is the gap the study seeks to fill.

There is a rapidly expanding literature that provides a useful basis of investigating wage determination in the absence of an inverse relationship between wage rate and unemployment rate. This literature discusses "efficiency wage" hypotheses which are based on the notion that firms find it profitable to pay wages that are higher than the market-clearing level. The efficiency wage hypothesis has a number of variants in the explanation of the positive relationship between wages and profits. These are the nutritional theories, shirking theories, turnover theories, adverse selection theories and sociological theories. Alternative theories are the employer size-wage effect and rent-sharing theories. These are discussed later.

These hypotheses have, however, been applied mainly to developed economies (Akerlof, 1982, 1984; Krueger and Summers, 1986, 1988; Brown and Medoff, 1989; Cappelli and Chauvin, 1991; Wadhawani and Wall, 1991; Levine, 1992; Reilly, 1995; Hildreth and Oswald, 1997; Huang et al., 1998). Although the notion of efficiency wage and productivity was first conceived in the context of developing countries (Leibenstein, 1957), and despite the prevalence of high unemployment in these countries, empirical studies on developing countries have been few (Rogers, 1975; Behrman et al., 1988; Strauss, 1986; Swamy, 1997; Valenchik, 1997). Others are Teal (1995, 1996), Soderbom and Teal (2001, 2002), Azam (1994), Azam and Ris (2001), Schaffner (1998), and Azam and Lesueur (1997).

This study extends the literature on the efficiency wage hypothesis in three dimensions. First, it intends to assess its explanatory power in providing an understanding of wage determination in the Nigerian manufacturing sector, relative to rent sharing theory, and thus provide a simultaneous assessment of the competitive models. Second, the results provide some insight into the labour market in the context of SAP and the role the labour market is expected to play. Specifically, SAP was expected to liberalize markets and thereby eliminate imbalances in markets, including the labour market. Third, the results from the study would be compared with those of other developing countries, especially in Africa. Such comparison may provide further insight into the operations of the labour market in Africa in particular and in developing countries in general.

2. Literature review

Theoretical issues

Traditional economic theory of wages and employment (unemployment) treats the labour market like any other market. Wages are determined by demand and supply forces. The firm has profit maximization as its motif force. A wage level above or below market-clearing level would result in imbalance. In addition, wages are related positively to labour productivity. Any observed wage differentials must therefore be due to differences in productivity that are assumed to be related to labour characteristics, especially human capital. Alternatively, such differentials could be due to compensating differences related to the characteristics of the job or industry. A job with less pleasant conditions would attract higher wages to compensate for the uncomfortable working conditions. So, the competitive market models predict that: (i) unemployment could only be due to wages being above market-clearing level, which in turn would be due to wage rigidity; and (ii) any wage differentials must be due to compensating or human capital differences. Sources of wage rigidity are usually identified as distortions arising from the influence of trade unions and government minimum wage legislation.

An alternative class of theories was developed in the literature to explain why firms, behaving in a way consistent with profit maximization, may deliberately set wages above market-clearing level, and differences in wages may not be due to compensating or human capital differences. This class of theories, referred to as efficiency wage theories, thus provides some explanation for downward rigidity in wages, even in the absence of exogenous factors (unions and minimum wage legislation), and they also explain why there may be a positive relationship between wages and unemployment.

Formally defined, efficiency wages occur when wages are deliberately set above market-clearing level to raise the cost of job loss to the workers and in turn, obtain, keep, and motivate good workers (World Bank 1995:27).

There are four variants to the efficiency wage theory. These are: (i) nutritional; (ii) turnover; (iii) shirking; and (iv) adverse selection theories.

The nutrition-based efficiency wage theory was first proposed by Leibenstein (1957), and further by Mazumdar (1959) and Bliss and Stern (1978). The theory provides a link between wages, nutrition and productivity. It aims primarily at explaining the link between wages and productivity in agriculture in developing countries. The theory is extended to explain wage rigidity in the face of unemployment. The extension is supposed to provide answers to the question: what prevents unemployed workers from obtaining employment by bidding down the wage? (Swamy, 1997). According to the theory, employers do not lower wages because if they do the workers would then consume less, thereby lowering their productivity. Thus, the theory provides endogenously-induced wage rigidity. This variant of the efficiency wage theory is particularly relevant to developing countries.

The labour turnover cost theory views turnover cost minimization considerations as the reason why employers would set wages above market-clearing level. Such cost includes cost of hiring and training new workers and production lost, which all affect the profitability of a firm. To minimize such cost, therefore, employers tend to pay higher wages to retain their workers. This theory is associated with Salop (1979).

Shirking theory is concerned with inducement to higher productivity. If marketclearing wage is seen as the opportunity cost to labour, paying that wage would have little incentive to perform well since losing the job would not be costly. Paying a wage above this level may make the cost of job loss larger and thereby encourage high productivity (Bulow and Summers, 1986; Shapiro and Stiglitz, 1984; Krueger and Summers, 1988). In a theoretical model which endogenizes monitoring, and which assumes that shirking is positively correlated with hierarchy ratio (ratio of management and supervisory staff to production workers), Azam and Lasueur (1997) show that the variable negatively affects wages paid.

Adverse selection theory, associated with Weiss (1980), treats the wage rate, in the face of non-observable quality, as a signal to attract a specific type of labour. Firms therefore pay higher wages to attract a better and larger pool of suitable applicants. Employing better quality workers would then lead to higher productivity. Groshen (1991a) provides a lucid summary of these theories.

Though these theories, particularly the non-nutrition based theories, were developed in the context of developed economies, they are useful in assessing labour markets in developing economies both in the context of understanding how flexible these markets are and in understanding better how anti-unemployment policies could be designed. This is particularly so in the case of Nigeria where unemployment has worsened in recent years.

The rent-sharing theory or gift exchange theory (Akerlof, 1982, 1984) considers that higher wages induce loyalty from workers, who in turn want to reciprocate such a gesture with higher productivity. Such loyalty would increase with the extent to which the firm shares its profit with the workers. An extension of the theory is that it assumes that bargaining occurs because of the power of workers to impose a credible threat to reduce the firm's profit to zero (Azam and Ris, 2001). In other words, the extension enables us to assess the relevance of the market imperfection argument associated with trade union power to wage determination in developing countries.

It may still be necessary to examine whether rent-sharing by firms, where it occurs, is due to stronger bargaining power of the workers (credible threat) or is voluntary, in which case it is part of the firm's existing incentive system. If it is due to strong union power, there would be a positive correlation between earnings and profits per worker (Blanchflower et al., 1996).

Empirical issues

mpirical literature on the efficiency wage theory has been dominated by studies on developed economies. The empirical approaches could be broadly categorized into two: the simple wage equation approach and the production function approach. Both approaches fall under indirect empirical tests. Few direct empirical tests have been carried out, primarily because of the lack of appropriate data. Much of the discussion that follows is on the indirect tests literature.

Among the few direct tests, Groshen and Krueger (1990) find that wages of registered nurses are negatively correlated with supervisory intensity, as predicted by the efficiency wage theory. Krueger (1991) finds that wages in corporate fast-food restaurants are higher than wages in similar franchised restaurants, consistent with efficiency wages as a substitute for monitoring.

Two notable studies in direct tests used case studies. Raff and Summers (1987) studied the Ford Motors output, wages and profit level before and after the introduction of wage increases in 1914. The daily wage was raised from US\$2.34 to \$5.00 and the working day was reduced from 9 to 8 hours. Following this policy, labour turnover declined significantly and productivity increased by 30% to 70%. Despite a higher wage bill, profits continued to increase, which is consistent with the efficiency wage theory. Another case study was on the Standard Linear Accelerator Centre (Riveros and Bouton, 1991). The firm indicated its intention to reduce the workforce by 10%. To avoid layoffs, workers volunteered to take a 10% wage cut. However, management rejected the offer on the grounds that lower wages would result in a reduction in the quality of the workforce, as the best workers would quit. This is consistent with the adverse selection variant of the efficiency wage theory.

In an indirect test, Krueger and Summers (1988) use a cross-section regression analysis of wages on one-digit industries, with human capital and demographic control and industry dummy. The authors report evidence which suggests that workers industry exerts a substantial impact on their wages even after controlling for human capital variables and a variety of job characteristics. The study finds that industries with high wage differentials have lower turnover and higher effort, consistent with efficiency wage theory. Leonard (1989), using the wage equation approach, finds a positive relationship between wages and productivity in a sample of high-tech firms in California. Cappelli and Chauvin (1991) tested the shirking model by examining the relationship between rates of employee discipline (dismissal) and relative wage premiums across plants within the same firms. They found that higher premiums are associated with lower levels of shirking. The production function approach is gaining popularity in the literature. If workers' efficiency rises with their wages, then production function augmented with measures of wage should yield a positive relationship between wages and output. Wadhwani and Wall (1991), using micro data from the UK, estimate a Cobb-Douglas production function, in which relative wage and unemployment are additional explanatory variables. The authors report a positive relationship between productivity and these variables. A similar relationship, which supports the efficiency wage theory, is found in other studies (Levine, 1992; Huang et al., 1998). Employer-size variant of the theory has also been empirically tested, and evidence has been found in its support (Krueger and Summers, 1988; Reilly, 1995; Groshen, 1991b).

Similarly, Blanchflower et al. (1996) find evidence of rent-sharing in wage determination in the USA. Hildreth and Oswald (1997) also find evidence consistent with the existence of rent-sharing in the UK, using longitudinal (panel) data to estimate a bargaining model.

Empirical literature on developing countries was limited until recently. This was mainly due to the lack of relevant data. Unlike in developed countries, the nutritionbased efficiency wage theory has been applied to developing countries. Strauss (1986) finds a positive relationship between caloric intake and farm labour productivity in Sierra Leone. Deolalikar (1988: 412) estimated Cobb-Douglas farm production function for rural south India, and finds a positive effect of improved nutrition on agricultural labour productivity which "supports the wage efficiency hypothesis". Swamy (1997), however, also in a study of India, finds no evidence of a positive relation between consumption and productivity.

A major study in a developing country is Teal (1995) on Ghana. Using data on manufacturing firms from a survey conducted in 1991-1994, the author uses a combination of production function and earnings function approaches to test for both efficiency wage and rent-sharing theories. From the study the author concludes that the evidence strongly supports the rent-sharing theory. Teal (1996) uses only the earnings function to test the rent-sharing theory. He examines the influence of union power on wages and earnings separately. The union effect more than doubles in size in the earnings equations (Teal, 1996). He concludes that allowances are the channels through which unions influence members' earnings. Soderbom and Teal (2001), in a study which tests, among others, issues for efficiency wage and rent-sharing theories, using updated data on Ghana in 1991–1997, find no evidence in favour of efficiency wages.

Another major study in a developing country is Valenchik (1997) on Zimbabwe. Using data from 201 manufacturing firms and 1,609 of their workers in 1993, the author tests the various variants of the theory. The results indicate a positive coefficient on all of the rent proxies, indicating that rent-sharing is a component of the wage setting process. The size, however, is not explained by rent-sharing as the coefficients are actually larger when rent proxies are included in the specifications (Valenchik, 1997). Furthermore, the broad conclusion is that turnover, hiring and sociological explanations seem more plausible than those on shirking (Valenchik, 1997).

Azam and Ris (2001) use the different implications of efficiency wage and rentsharing theories to try and isolate the two effects. They do this by running an earnings equation in which the variables from other theories are sequentially introduced, with firm level data from Côte d'Ivoire. There seems to be less support for the efficiency wage theories and more for rent-sharing and hold-up power of workers. The results from introducing firm-specific variables suggest that a purely competitive model is not capable of explaining wage determination in Côte d'Ivoire.

Soderbom and Teal (2002), as part of a broad study on Nigeria's manufacturing sector, examined wage determination in the sector. Although not an explicit test of the efficiency wage and rent-sharing theories, earnings function equations were estimated for 2000/2001 data. The data set covers 176 firms and 868 workers from these firms. The conventional basic human capital variables are found to be highly significant determinants. The firm characteristics that the study finds significant are size, age, labour productivity and technical efficiency.

Of particular interest from this study, is the observation that real profit per employee (rent-sharing) variable is not significant at all. In the two equations in which it was included, its estimated values are -0.784, t = 0.3 and -0.473, t = 0.2. The size variable is the most significant, followed by firm age, technical efficiency and labour productivity in that order. The authors conclude that "there appears to be a relationship between the size of the firm and the earnings of the worker not explained either by observable human capital characteristics of the worker or by the profitability or productivity of the firm" (Soderbom and Teal, 2002:58). Two observations may be made on this conclusion. One, as the authors also note, these measures (e.g. profitability) will be highly correlated with other variables included in the equation, for example productivity. It was therefore surmised that "whether there are effects for either profitability or the capital labour ratio on earnings awaits further work on the data" (Soderbom and Teal, 2002:59). In light of the simultaneity problem in the determination of profitability, wages and productivity in firms, an area for further work is to examine whether instrumentizing these variables would make a difference to the estimated value of the rent-sharing variable.

The authors also recognize the possibility of efficiency wage working through the firm size channel. They note that "(one) set of explanations argues that workers of the same quality do get paid more by large firms. One of these explanations argues that monitoring of workers is more expensive in large firms so that to ensure workers work hard the penalty from failure to do so needs to be higher in such firms ... This is part of the efficiency wage argument for firm size wage differentials ... There may be other explanations for such a correlation. It may be that workers in more productive firms can obtain higher wages, a form of rent-seeking" (Soderbom and Teal, 2002: 53). As these issues are not addressed in that paper, they provide justification for this study. Inclusion of a variable for monitoring technology (number of supervisors per worker) and for workers' bargaining power (unionization), enables explicit examination of these issues.

3. Methodology

wo methodologies were applied in this study, namely the production function approach and the earnings function approach. The production function approach, (see Wadhwani and Wall, 1991; Teal, 1995), tests for efficiency wage and rent-sharing influences by analysing the relation between relative wage and firm's productivity. The earnings function approach (see Teal, 1996; Azam and Ris, 2001), similarly tests for the competing models.

The production function approach begins with the standard Cobb-Douglas production function:

$$Q_{i} = A_{i} K_{i}^{\alpha} L^{\beta}_{i}$$
⁽¹⁾

The subscript *i* denotes the individual firm; Q is value added. K is capital stock; L is level of employment; and A is the conventional constant variable in the production function.¹ The efficiency wage theories imply that relative wage and unemployment should be included as additional explanatory variables in Equation 1. According to Wadhwani and Wall (1991), the efficiency wage considerations may be incorporated into the equation in two different ways. The first approach enters effort into the production function in the standard labour-augmenting manner, implying a unit effort elasticity with respect to the wage. The second approach relaxes the unit effort wage elasticity by allowing the efficiency wage variable to affect β , and not L in Equation 1. Wadhwani and Wall (1991) present elaborate discussion on this.

In this study, the second approach was adopted. Given the low level of labour productivity in Nigerian manufacturing, it may be difficult to accept the unit effort elasticity assumption with respect to the wage. It is more realistic to accept a less than unit elasticity. In addition, due to lack of industry unemployment rates, the unemployment variable was not included in the equation estimated. The efficiency wage-augmented production function in Wadhwani and Wall (1991) thus becomes:

$$\ln Q_{i} = a + \alpha \ln K_{i} + \beta_{0} \ln L_{i} + \beta_{1} \ln (w/w)_{i} + \beta_{2} \ln U_{i}, \qquad (2)$$

where W is firm's wage; and w* is industry average wage.

A test of the efficiency wage model is whether the relative wage affects productivity. However, it is possible to observe a positive association between wage and productivity for reasons not related to the efficiency wage factor. One reason why this may be so is simultaneity bias. For example, if workers share in profits, then higher productivity will cause high relative wages.

One way to control for this possibility is to incorporate a variable which captures a firm's financial condition (liquidity). In that case, profitability enters as an additional explanatory valuable. An alternate possibility is to incorporate the effect of unions. The argument is that the existence of strong unions makes rent-sharing more likely.

A second reason why observed positive association between relative wage and productivity may be spurious relates to differences in labour quality that cannot be observed. One way to control for this is to allow for firm specific fixed effect, specifically, skill-mix and technology effects.

With these considerations, Equation 2 becomes:²

where π/L measures profit per worker; and DU stands for unionization dummy variable (1 if unionized and zero if otherwise). This is the equation used in this study. Firm's wage rate is measured as average monthly wage of firm's workers before tax, and industry wage (w*) is measured as average monthly wage of workers before tax in the industry to which the firm belongs. On the assumption that profitability may also be influenced by the quality of factors (labour and capital), profit per worker is introduced to capture production technology effects. This explains its inclusion in the production function equation. Furthermore, the variable provides a test of the rentsharing hypothesis.

The Cobb-Douglas production function is adopted, as studies have shown that it reasonably describes the production technology in Nigerian manufacturing (see Olaloye 1976).

For the earnings function approach, the standard earnings model is sequentially augmented with variables capturing efficiency wage and rent-sharing considerations. These are profit per employee as in standard rent-sharing literature, and monitoring technology proposed by Shapiro and Stiglitz (1984) in a shirking model of the efficiency wage theory, to be measured by number of supervisors per production worker (see Konings and Walsh, 1994; Azam and Ris, 2001).

The earnings function starts with the form:

$$W = F(H, F, W^{e})$$
(4)

where W is wage rate in the firm; H is a vector of human capital variables; F_c is a vector of firm-specific effects; and W^e is the exogenously available wage.

Following Teal (1996), Equation 4 is transformed into an earnings equation, with worker characteristics and firm-specific characteristics. These include relevant efficiency wage and rent-sharing variables. Equation 4 is thus expanded and becomes:

 $InE_{i} = a + \beta olnAge_{i} + \beta_{1}InAge_{i}^{2} + \beta_{2}InEdu_{i} + \beta_{3}InEdu_{i}^{2} + \beta_{4}InTenure_{i} + \beta_{5}In^{\pi}/L + \beta_{6}InFS + \beta_{7}Insupv/L + \beta_{8}Union + e$ (5)

The union variable measures whether the firm is unionized (for which dummy variable is used). Profit per worker is measured as π/L . Considering that relative wages, value added and profits are determined simultaneously in firms, instrumental estimates are also undertaken to address the simultaneity problem. The two equations estimated are (3) and (5).

4. Data and source

The data used in the study were drawn from an annual survey of Nigerian manufacturing enterprises (NMES) conducted by the United Nations Industrial Development Organization (UNIDO), Centre for the Study of African Economies, Oxford, and some collaborating institutions in Nigeria between July and September 2001. Data were collected for 1998, 1999 and 2000. The survey instrument had two components: the firm questionnaire and the workers and apprentices questionnaires. This allows for the construction of a matched firm-labour data set which includes human capital characteristics and some firm-specific characteristics.

The survey covered Lagos and Ibadan (Western zone), Abia, Enugu, Onitsha and Nnewi (Eastern zone) and Kaduna and Kano (Northern zone). Additional information was collected on location, ownership, formal/informal sector, number of employees, profit, revenue, value of output, cost of raw materials, value added, gross profit, number of foremen and supervisors, loans from bank and non-bank sources and overdraft, all on the firm. On employees, age, education, annual wages and salaries, and tenure were covered.

The survey covered 176 firms drawn from the four manufacturing sub-sectors of food processing (15), wood work including furniture and paper processing (41), textile and garments (66), and metal, machinery and chemicals (54). A total of 868 workers were interviewed in these firms simultaneously, broken down into the four sub-sectors as 89, 203, 281 and 295 respectively. The firms covered by size included micro (28), small (53), medium (46) and large (49); size being determined by number of employees: 5 employees or fewer, 6 to 20 employees, 21 to 75 employees, and above 75 respectively.

NMES was designed to make the data collected comparable to that from other African manufacturing firms. Therefore, it modelled on the World Bank's Regional Programme on Enterprise Development (RPED). The survey was designed to collect both contemporaneous and retrospective information for 1998, 1999 and 2000 on most of the variables. Workers were asked for their earnings in the current year and previous year, thus 2000 and 2001.

5. Results

Variables used and estimation

Table 1. The estimation was carried out using both the ordinary least squares (OLS) and two-stage least squares (2SLS) techniques. The 2SLS estimation enables controlling for simultaneity problems. Instrumental variables are introduced. A fundamental problem in instrumental variable estimation is the choice of the instruments. However, in the context of standard regression, where the matrix of fixed regressors is uncorrelated with the error vector, the lagged values of regressors themselves may be chosen as instruments.

The consistency of instrumented estimators comes at the cost of higher standard errors. Furthermore, lagged instrumental estimators produce more efficient results than contemporaneous instrumental variables (IV) because they reduce the possibility of co-movement in the instrumented and the instrumental variables (Swamy and Fikkert, 2002). In this study, lagged IV_s were used. In the earnings function the instrumented variable was profit per worker, and the instrument was profit per worker lagged two periods (that is, value for 1998 was used as instrument on value for 2000).

In the production function, instrumented variable was relative wage, and the instrument was lagged profit per worker. In each case, the instruments were found to be correlated with the instrumented variables.

For the production function model, the dependent variable was the natural logarithm of firm's value added. The independent variables were capital stock, number of workers, relative wage, profit per worker, and unionization. In the case of unionization, a dummy variable was used (1 if firm is unionized, zero if otherwise). For capital stock, a sizeable number of firms did not report values in the survey data. Values were therefore predicted for 55 firms, to bring the number of observations to 176, the number of firms in the survey. IPOLATE technique in Stata was used.³ Capacity utilization was used as predictor; it gave better values than gross output. This became necessary to generate enough observations to estimate the model. Data on these variables, except for capital

stock, are available for 1998–2000 (Table 1). Data for 2000 were used in the estimation, while 1998 values were used as lagged values of the relevant instrumental variables.

For the earnings function model, the dependent variable was the natural logarithm of individual worker's monthly earnings. The independent variables were age and education level of individual workers, firm-size measured as a continuous variable by the number of workers in the firm, and tenure measured by the number of years the worker had been in employment at the current firm. Others were profits per worker derived as annual profits for each firm divided by the total number of workers, unionization, and supervisors per worker measured as the ratio of production workers to supervisory and management staff; age of worker squared was used to capture the experience effect.

Age and tenure were expected to have a positive effect on earnings. Profits per worker, which reflect both the level of rents available to the firm to share with its employees if it desires and the firm's ability to pay, are expected to have a positive effect on earnings to support the rent-sharing theory. To assess the relevance of the efficiency wage theory, supervisors per worker was used to assess the shirking and monitoring variant of the theory. The theory predicted a negative relationship between earnings and supervision. The theory also predicted a positive relationship between earnings and profits per worker (ability to pay). Lastly, the unionization variable was included to further assess the rent-sharing explanation, specifically to examine the influence of union bargaining power on rent shared. A positive relationship was expected between earnings and union power. That is, rent-sharing which is due to union power predicts a positive correlation between earnings and profits per worker.

As Table 1 shows, the mean monthly earnings were around N10,000 (US\$89.30 at N/\$ 111.94 in 2001). Table 2 shows the mean earnings by education level, skill category and firm-size. The table shows that monthly earnings increased with education level after primary level. Mean monthly earning for primary level was 75.6% of that of secondary level, which in turn was about 47% of that of university graduates. Skilled workers were paid twice as much as unskilled workers. Earnings increased with firm-size. The differentials were more pronounced between micro and small firms (36%) and medium and large firms (38%).

The results in Table 1 show that over the period (1998–2000), productivity, as measured by value added, steadily rose, and so did firms' profits. This trend is predicted by both efficiency wage and rent-sharing models.

Variable	N	Mean	Std dev
		Year = 1998	
Value added	144	76759956.66	301301008
No. employees in firm	788	235.7576142	676.1520816
Firm relative wage	145	0.9071	0.6364
Profit per employee	120	158214.1200	312243.2000
Production workers	0		
Supervisor/production	0		
Monthly wage before tax	0		
Capital stock	Ő		
Total output	148	91000000 0000	808000000 0000
Capacity utilization	141	41 7305	26 3368
Unionization	148	0.2432	0.4305
		Year = 1999	
Value added	144	103958881	501697729
No employees in firm	799	222 7847309	638 3572854
Firm relative wage	145	0.9071	0.6364
Profit per employee	127	194334.3000	331110.8000
Production workers	134	126.5448	396.0890
Supervisor/production	134	0.3232	0.4691
worker			
Monthly wage before tax	139	10832.1200	28005.5100
Monthly wage after tax	0		
Capital stock	14	2200679.0000	2334754.0000
Total output	148	2170000000.0000	2290000000.0000
Capacity utilization	141	44.5816	24.4260
Unionization	148	0.2432	0.4305
		Year = 2000	
Value added	144	105206276	547567082
No. employee in firm	819	208.2649573	586.6990035
Firm relative wage	145	0.9071	
Profit per employee	131	230517.200	356622.0000
Production workers	144	97.0069	317.9072
Supervisor/production	144	0.5728	0.7770
worker			
Monthly wage before tax	145	10485.9400	7363.3450
Monthly wage after tax	145	10036.4900	6818.4370
Capital stock	176	1555692.99	1771641.38
Total output	148	30100000.0000	132000000.0000
Capacity utilization	139	42.7194	23.6940
Unionization	148	0.2432	0.4305

Table 1: Descriptive statistics

Source: Nigeria Manufacturing Enterprises Survey (NMES) 2001 dataset, UNIDO/CSAE (2002).

Education level	Sample proportion (%)	Number	Earnings mean in Naira (2000) Price
None	2.2	25	9,951
Primary dropout	0.7	8	5,134
Primary	21.0	238	7,080
Secondary	62.1	703	9,363
University	13.9	157	19,755
Skill category			
Unskilled	40.8	461	6,253
Skilled	59.2	670	13,124
Firm size category			
Micro	3.9	44	4,945
Small	16.8	190	7,646
Medium	34.0	385	8,254
Large	45.3	512	13,322

Table 2: Mean monthly earnings by education level, skill category and firm size, 2000–2001

Source: NMES 2001 dataset, UNIDO/CSAE (2002).

The production function results

preliminary simple correlation analysis was done. It was found that there is a positive, though low (0.20 and 0.24) correlation between relative wage and value added, and gross output respectively, a mild support for the efficiency wage model.

The results of estimation of the production function are reported in Table 3. The estimated coefficients are significantly different between the OLS and 2SLS. The five variables are all statistically significant at the 99% level in the OLS estimation, whereas only two (capital and labour) are significant at that level in the 2SLS estimation. The remaining three (efficiency wage and rent-sharing) variables are significant at the 90% level. In addition, the value of t-ratios is larger in the OLS estimation. However, as mentioned above, higher standard errors (lower t-ratios) are a cost of the consistency of instrumented estimators (see Swamy and Fikkert, 2002). The explanatory power of the model declined from 68% to 60%. Furthermore, profit per worker, the rent-sharing efficiency wage variable, is wrongly signed.

The coefficient of the relative wage (efficiency wage) variable has the correct sign and is statistically significant at the 99% level in the OLS estimates (Table 3). This is a prediction of the efficiency wage model. The coefficient on relative wage is significantly lower than that on profit per worker. This suggests that the elasticity of effort with respect to wages is less than one. The result seems to suggest weak bargaining on the part of workers, who are therefore less able to bargain for wage rate to keep pace with productivity as labour productivity grows. This point is also acknowledged by Wadhwani and Wall (1991). In addition, the elasticity of output with respect to relative wage is low (0.24 - 0.50) to be consistent with pure efficiency wage model. Even though the elasticity is higher in the 2SLS estimates (0.50), it is less significant.

As mentioned above, the existence of a positive correlation between wages and productivity may also reflect rent-sharing influences. This informed the inclusion of profitability and unionization variables. Both variables produced correctly signed and statistically significant coefficients in the OLS estimation. The rent-sharing (profit per worker) coefficient is larger than the relative wage (efficiency wage) coefficient in the OLS estimation. In the 2SLS estimation all three variables (relative wage, wage per worker and unionization) are of the same level of significance (90%) while the rent-sharing ($^{P}/L$) variable is wrongly signed, and the relative wage coefficient is substantially larger than the two coefficients.

Thus, while it could be argued that OLS estimates showed support for both efficiency wage and rent-sharing models, 2SLS estimates showed weaker support. Overall, it could be concluded that the results suggest that both efficiency wage and rent-sharing considerations are relevant in explaining wage determination in the Nigerian manufacturing sector. While the 2SLS could be considered a better method because it allows for instrumentizing to control for the simultaneity problem, the fact that the coefficient on profit per worker (rent-sharing) variable is wrongly signed, suggests that only efficiency wages and the unionization variant of rent-sharing seem to work in Nigerian manufacturing, based on the production function approach.⁴ However, in the light of the wrong sign on the profit variable, it seems as if it is only the efficiency wage model that works.

However, the argument is that if unionization does not have a significant effect on the coefficient on relative wage, this would suggest less influence of rent-sharing (Wadhwani and Wall, 1991). The results from both the OLS and 2SLS estimates show the relative wage coefficient to be higher than the unionization coefficient. Similarly, the coefficient on profitability variable became lower and less significant and wrongly signed after controlling for the simultaneity bias (2SLS estimates), whereas the unionization variable remained correctly signed, though also less significant. This suggests that rent-sharing may be the more influential of the two. There is therefore a need for further tests to discriminate between the models. The earnings function is analysed next.

Explanatory variables	OLS estimate	2SLS
Capital	0.23*	0.09*
	(4.58)	(2.30)
Labour	0.41*	0.89*
	(3.77)	(2.30)
Relative wage	0.24*	0.50***
	(3.16)	(1.40)
Profit/worker	0.43*	- 0.13***
	(5.11)	(1.49)
Unionization	0.19*	0.11***
	(3.22)	(1.29)
Constant	8.62	11.18
	(4.86)	(5.47)
B ²	0.68	0.60
E	38.68	30.97
N	131	131
		101

Table 3: Estimates of production functionDependent variable: log value added

Note: the explanatory variables, except unionization dummy, are in logs; figures in parentheses are t-values. The symbols --- and - beside the estimated coefficients denote statistical significance at 0.10 and 0.01 levels respectively. N is the number of observations used in estimation.

Table 4 presents OLS and 2SLS estimates for the earnings function. The results showed a reasonable consistency across the two models. Except for tenure, firm-size, supervisor/worker, and unionization variables, level of significance of estimated coefficients was consistent across the models. This obviates the need to analyse the models separately, unlike what had to be done for the production function models.

The human capital variables are all highly significant. This is consistent with evidence from other country studies (Manda, 2001; Soderbom and Teal, 2001; Soderbom and Teal, 2002). This is also consistent with the neoclassical model which emphasizes labour quality as a determinant of earnings differentials. Experience on the current job (tenure) also provides significant explanation. The negative impact of the education variable is counter-intuitive, as it seems to suggest that earnings fall with education. A possible explanation may be the fact that the variable was measured in a non-continuous way in the data used.⁵ The significantly negative coefficient of supervisor per worker is as expected, especially in the situation of increased intensity of supervision between 1999 and 2000 (see Table 1). This reflects the relevance of the shirking model to Nigerian manufacturing in the period covered in the survey.

The point estimates of the coefficients are, however, generally low despite being statistically significant. Among the three variables of interest, the profits variable was consistently significant at the 95% level, whereas the supervision and bargaining variables, which are significant at the 99% level in OLS estimates, declined to 95% in 2SLS estimates. Point estimates of efficiency variables consistently increased across

the models.

In sum, results from the estimated models indicate that the efficiency wage (relative wage) and rent-sharing variable (unionization/bargaining and supervision/monitoring) are significant determinants of wages. Both the efficiency wage and rent-sharing models predict a positive association between earnings and profits per worker. The efficiency wage model predicts a negative association between earnings and supervision. The rent-sharing model predicts a positive relation between unionization and earnings. In addition, both models predict a positive relation between productivity and wages. Almost all the predictions are supported by our results. A few caveats may be observed here. The findings in this study could be biased by unobserved firm and worker heterogeneity. The data used did not allow for the testing for this. This should therefore be taken into account in the interpretation of the results.

Furthermore, it is possible that the findings may be robust to the exclusion of the 55 firms that did not report values for capital stock. However, there were enough firms remaining (121) to ensure that the overall conclusion from the results would not have

	3 3	
Explanatory variables	OLS model	2SLS model
Age	0.10* (6.02)	0.092* (8.73)
Age ²	-0.001* (4.66)	0.503* (6.89)
Edu	-0.11* (5.73)	-0.119* (7.88)
Edu ²	0.01* (8.36)	0.427* (5.59)
Tenure	0.01* (3.18)	0.058** (1.67)
Firm size	0.001* (2.53)	0.263** (2.06)
Profit/worker	0.001** (2.26)	0.385** (1.96)
Superv./worker	-0.10* (2.99)	-0.379** (1.93)
Unionization	0.220* (4.06)	0.536** (2.11)
Constant	9.410 (11.23)	0.292 (5.79)
R ²	0.38	0.37
F	14.71	30.11
N	758	758

Table 4: Estimates of earnings function Dependent variable: log earnings

Note: (i) the explanatory variables, except unionization dummy, are in logs; figures in parentheses are tvalues. The symbols -- and - beside the estimated coefficients denote statistical significance at 0.05 and 0.01 levels respectively. N is the number of observations.

(ii) Appendix Table 1 presents summary statistics for the variables in the earning function.

6. Conclusion

been substantially affected.

This study shows that the human capital model explains wage determination in Nigerian manufacturing. Beyond that, however, the two approaches applied in the study, namely the production function approach, and the earnings function approach, and both OLS and 2SLS produce results which support the relevance of both efficiency wage and rent-sharing models. Though attempts to control for simultaneity bias produced 2SLS estimates that are less significant than OLS estimates, the levels of significance are still in the acceptable range (90% to 99%).

In the context of other studies, Soderbom and Teal (2002) find less direct evidence on rent-sharing or efficiency wages for Nigerian data, using the earnings function approach. The authors identified limitations in their results and suggested areas for further investigation before more conclusive inference could be drawn on the data. One such area is explored in this study by instrumentation of the estimation procedure. An additional anecdotal reason why the efficiency wage is more plausible in Nigeria is that price inelasticity of demand for most manufactured commodities in Nigeria enables producers to pass any wage increase on to prices and generate high profits. Inflation in Nigeria in recent years has been between 10% and 19%, partly as a result of this.

Azam and Ris (2001) find evidence more in support of rent-sharing in Côte d'Ivoire. Although Valenchik (1997) finds evidence in support of rent-sharing, support was also found for efficiency wage variables like turnover, hiring and sociological considerations.

The policy relevance of the evidence from this study is that in its efforts to tackle unemployment in Nigeria, the government needs to look beyond human capital factors and union-induced labour market distortions. An equally important factor is the influence of efficiency wage-induced non-market clearing wages.

Notes

¹A is interpreted as "firm specific fixed effect" in Wadhwani and Wall (1991) which was adopted for this study. However, since only data for 2000 were used in our regression (i.e., cross section analysis), it could not be so interpreted.

The Cobb-Douglas production function reasonably describes the production technology in Nigerian manufacturing, as found earlier by Olaloye (1976).

²Due to data limitations, unemployment rate could not be included in our estimation, but profit per worker was retained to capture the skill-mix effect. In addition, for reasons given in note (1), firm specific fixed effect was not estimated.

³ The IPOLATE procedure is as follows:

IPOLATE y, x, generate (new y), where y and x are the dependent and independent variable respectively, and values of original "y" and linearly interpolated values for the missing values in original "y" the independent variable should be one capable of predicting y. I owe this suggestion to Prof. John Anyanwu, African Development Bank, Tunis.

⁴I owe this clarification, with appreciation, to an anonymous referee of the report.

⁵ This observation is due to an anonymous referee and it is appreciated.

References

- Adebayo, A.A. 1999. "Confronting wage crisis in Nigeria: Perspectives and policy options". Development Policy Centre Working Paper Series No. 6 (January). Development Policy Centre, Ibadan, Nigeria.
- Aigbokhan, B.E. 1988. *Planning, Employment and Income Distribution in Nigeria*. Lagos: Kristal Publications.
- Aigbokhan, B.E. 1992. "Dimensions of the unemployment problem in Nigeria". National Centre for Economic Management and Administration (NCEMA) Training Lecture, Ibadan, Nigeria.
- Akerlof, G.A. 1982. "Labour contracts as partial gift exchange". Quarterly Journal of Economics, 97: 543–69.
- Akerlof, G.A. 1984. "Gift exchange and efficiency-wage theory: Four views". *American Economic Review*, 74: 79–83.
- Azam, J.P. 1994. "Recent Developments in the Developed-country Literature on Labour Markets and the Implications for Developing Countries". In: S. Horton et al., eds., *Labour Markets in an Era of Adjustment*. Vol. 1 Issues Papers (World Bank: EDI Development Studies).
- Azam, J.P. and J.Y. Lesueur. 1997. "Efficiency wage and supervision: Theory and application to the Ivorian manufacturing sector". *Journal of African Economics*, 6(3): 445–62.
- Azam, J.P and C. Ris. 2001. "Rent-sharing, hold up, and manufacturing: Wages in Côte d'Ivoire". Policy Research Working Paper 2600. The World Bank, Washington, D.C.
- Behrman, J., A.B. Deolaliker and B.L. Wolfe. 1988. "Nutrients: Impacts and determinants". World Bank Economic Review, 2(3): 299–320.
- Blanchflower, D.G., A.J. Oswald and P. Sanfey. 1996. "Wages, profits, and Rent-sharing". *Quarterly Journal of Economics*, 111: 227–52.
- Bliss, C. and N. Stern. 1978. "Productivity, wages and nutrition, Part I: The theory". *Journal* of *Development Economics*, 54: 331–62.
- Brown, G. and J. Medoff. 1989. "The employer size-wage effect". *Journal of Political Economy*, 97: 1027–59.
- Bulow, J.L. and L.H. Summers. 1986. "A theory of dual labour markets with application

to industrial policy, discrimination and Keynesian unemployment". *Journal of Labour Economics*, 4: 376–414.

- Cappelli, P. and K. Chauvin. 1991. "An inter-plant test of the efficiency wage hypothesis". *Quarterly Journal of Economics*, 106: 769–87.
- Deolalikar, A. 1988. "Nutrition and labour productivity in agriculture: Estimates for rural south India". *Review of Economics and Statistics*, 70: 406–13.
- Faruquee, R. 1994. "Nigeria: Ownership abandoned". In I. Hussain and R. Faruquee, eds., Adjustment in Africa: Lessons from Country Case Studies. Washington, D.C.: The World Bank.
- Fashoyin, T.A., O. Matanmi and A. Tawose. 1994. "Reform measures, employment and labour market processes in the Nigerian economy: Empirical findings". In T.A. Fashoyin, ed., *Economic Reform Policies and the Labour Market in Nigeria*. Lagos: NIRA and Friedrich Ebert Foundation.
- FOS. 1998. *Review of the Nigerian Economy, 1997 edition*. Lagos: Federal Office of Statistics.
- FOS. 2001. "Labour Force Sample Survey December 2000 (Nigeria and ILO)". *Statistical News* No. 322 (June).
- FOS. 2001. "Labour Force Sample Survey December 2000 (Nigeria and ILO)". *Statistical News* No.327 (August).
- Groshen, E.L.1991. "Five reasons why wages vary among employers". *Industrial Relations*, 30(3): 350–81.
- Groshen, E.L. 1991. "Sources of intra-industry wage dispersion: How much do employers matter?" *Quarterly Journal of Economics*, 106: 869–84.
- Groshen, E.L. and A.B. Krueger. 1990. "The structure of supervision and pay in hospitals". *Industrial and Labour Relations Review*, 43 (3): 134-46.
- Hildreth, A.K.G. and A.J. Oswald. 1997. "Rent-sharing and wages: Evidence from company and establishment panels". *Journal of Labour Economics*, 15(2): 318–37.
- Huang, T.L., A.H. Hallam, P.F. Orazem and E.M. Paterno. 1998. "Empirical tests of efficiency wage models". *Econometrica*, 65: 125–43.
- Konings, J. and P. Walsh. 1994. "Evidence of efficiency wage payments in UK firm level panel data". *Economic Journal*, 104: 542–55.
- Krueger, A.B. 1991. "Ownership, agency and wages: An empirical analysis". *Quarterly Journal of Economics*, 106: 75–102.
- Krueger, A.B. and L.H. Summers. 1986. "Reflections on the inter-industry wage structure". In: K. Lang and J. Leonard, eds., Unemployment and the Structure of Labour Markets. London: Basil Blackwell.
- Krueger, A.B. and L.H. Summers. 1988. "Efficiency wages and inter-industry wage structure". *Econometrica*, 56(2): 259–93.
- Leibenstein, H. 1957. "The theory of unemployment in densely populated backward areas". In: G.A. Akerlof and J. Yellen, eds., *Efficiency Wage Models of the Labour Market*. New York: Cambridge University Press.
- Leonard, J.S. 1989. "Wage structure and dynamics in the electronics industry". *Industrial Relations*, 28: 251–75.
- Levine, D.I. 1992. "Can wage increases pay for themselves? Tests with production function". *Economic Journal*, 102: 1102–15.

- Manda, D.K. 2001. "Firm size and earnings in Kenyan manufacturing: A quantile regression analysis. Interim Report". Presented at the African Economic Research Consortium Biannual Workshop in Nairobi, Kenya (December).
- Mazumdar, D. 1959. "The marginal productivity theory of wages and disguised unemployment". *Review of Economic Studies*, 26: 190–97.
- Oladeji, S.I. 1994. "Effects of Structural Adjustment Programmes on employment in the manufacturing sector". In Fashoyin, ed. Lagos: NIRA and Friedrich Ebert Foundation.
- Olaloye, A.O. 1976. "Wage earnings in Nigeria's manufacturing industries". *Nigerian Journal* of Economics and Social Studies, 18: 407–20.
- Oni, B. 1994. "SAP and the informal sector in Nigeria: a case of increasing unemployment?". In: Fashoyin ed. Lagos: NIRA and Friedrich Ebert Foundation.
- Raff, D. and L. Summers. "Did Henry Ford Pay Efficiency Wages?". Journal of Labour Economics 5(2): 557-86.
- Reilley, K.T. 1995. "Human capital and Information: The employer size-wage effects". *Journal* of Human Resources, 30:(1) 1–18.
- Riveros, L.A. and L. Bouton. 1991. "Efficiency wage theory, labour market and adjustment". Working Paper Series no. 731, The World Bank, Washington, D.C., July.
- Rogers, B.L. 1975. "Nutritionally-based wage determination in the low income labour market". Oxford Economic Papers, 27: 61–81.
- Salop, S. 1979. "A model of the natural rate of unemployment". *American Economic Review*, 69: 117–25.
- Schaffner, J.A. 1998. "Premiums to employment in larger establishments: Evidence from Peru". *Journal of Development Economics*, 55: 81–113.
- Shapiro C. and J. Stiglitz. 1984. "Involuntary unemployment as a worker discipline device". *American Economic Review*, 74: 433–44.
- Soderbom, M. and F. Teal. 2001. "Firm-Size and Human Capital as Determinants of Productivity and Earning". Centre for the Study of African Economies Working Paper Series 2001-09, May.
- Soderbom, M. and F. Teal. 2002. "The performance of Nigerian manufacturing firms: Report on the Nigerian Enterprise Survey 2001". The United Nations Industrial Development Organization and Centre for the Study of African Economies, Oxford, August.
- Strauss, J. 1986. "Does better nutrition raise farm productivity?" *Journal of Political Economy*, 94: 297–320.
- Swamy A.V. 1997. "A simple test of the nutrition-based efficiency wage model". Journal of Development Studies, 53(1): 85–98.
- Swamy, A.V. and B. Fikkert. 2002. "Estimating the contributions of capital and labour to GDP: An instrumental variable approach". *Economic Development and Cultural Change*, 50(3): 693–708.
- Teal, F. 1995. "Efficiency wages and rent-sharing: A note and some empirical evidence". Centre for the Study of African Economies WPS/95-17. Department of Economics, University of Oxford, England.
- Teal, F. 1996. "The size and sources of economic rents in a developing country manufacturing labour market". *Economic Journal*, 106: 963–76.
- UNIDO/CSAE. 2002. Nigeria Manufacturing Enterprises Survey (NMES) 2001 Report. United Nation Industrial Organisation/Centre for the Study of African Economies: Geneva/ London.

- Valenchik, A.D. 1997. "Government intervention, efficiency wages, and employer size-wage effect in Zimbabwe". *Journal of Development Economics*, 53(2): 305–38.
- Wadhwani, S.B. and M. Wall. 1991. "A direct test of the efficiency wage model, using UK micro-data". Oxford Economics Papers, 43:529-48.
- Weiss, A. 1980. "Job queues and layoffs in Labour Markets with Flexible Wages" *Journal of Political Economy*, 88:526–38.
- World Bank. 1995. Workers in an Integrating World, World Development Report, Washington DC.

Appendix

Table A1: Summary statistics on variables in the earning function

	-			-	
VARIABLE	OBS.	MEAN	STD. DEV.	MIN.	MAX.
AGE	2,505	33.45269	9.504469	12	70
AGE2	2,505	1209.382	708.1975	144	4,900
EDUYR	2,463	11.13276	4.287855	0	17
EDUYR2	2,463	142.3167	82.84993	0	289
TENUR	2,505	6.359248	6.503028	0	35
FSIZE	2,412	221.5452	633.3559	0	5,088
PROFT-WKR	2,339	228,090.9	347,996.6	-96,611.3	2,274,018
SUP-PROWKR	1,622	0.4864748	0.6383123	0	5
UNION	2,505	0.3173653	0.4655438	0	1

Note: Of the 2,505 total observations, 758 had complete information relevant for inclusion in the estimated function.

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