REVIEW OF THE USE OF PRODUCTION FUNCTIONS IN RESEARCH

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ABSTRACT

Production functions are very vital means of knowing how inputs relate to output. Some studies *carried out by researchers have gone beyond the use of productions in determining the relationship between input, but have tried to account for institutional and environmental factors external to the firm.*

Many researchers have used different types of production functions in their studies. They include the linear, quadratic and Cobb-Douglas production functions. The choice of any functional form depends on the econometric criteria of that particular study.

This paper is aimed at viewed the use of production functions and recommend measures that would assist researchers in making their choice of the use of production functions.

It was recommended among others that researchers should consider first the three decision rules ad stated by Yotopoulos (1967) before making a choice of the functional form to use.

INTRODUCTION/OBJECTIVES:

The process of transforming physical inputs to output is called production while the technical relationship between the physical inputs and output is called the production function. It describes the laws of proportion, represents the technically efficient methods of production (Koutsoylannis, 1979; Adegeye and Dittoh, 1985). Production functions are useful for comparing the average and marginal values of specific resources. (Upton, 1979).

The objectives of this paper are to:

i) Identify the production functions commonly used by researchers.
ii) Discuss the production functions identified.
iii) Make recommendations to researchers in their choice and use of production functions.

Studies carried out by Timmer (1970) and Carlsson (1972) show that the use of production functions have gone beyond using them to compare the average and marginal values of specific resources, but have tried to use them to account for institutional and environmental factors external to the firm.

LITERATURE REVIEW

Production function is purely the technical relationship between the physical inputs and output. It describes the laws of proportion, represent the technology of the firm and include all the technically efficient methods of production (Koutsoyiannis, 1979). The choice of any particular production process at any time is a decision which depends not a technical decision alone.

The production functions commonly used by researchers include the linear, quadratic and Cobb-douglas production functions.

Yotopoulos (1969) stated three decision rules for which the choice of any functional form can be based. They are:

i) The production function presupposes a production process with a specific "logic". The functional form chosen should be consistent with the true relationship. If the exact relationship is not know ex-ante, as is often used for the testing of an algebraic form with various criteria of statistical adequacy may nevertheless be a satisfactory means to approximate the true function.

ii) The form chosen should offer possibilities of providing a verified explanation of wide range of empirical phenomena, which would otherwise to given adhoc interpretation, and

iii) It is desirable that the function display computerional feasibility.

For example, Cohen (1981) used the Cobb-Douglas production function to analyse the economic interrelationship between millet and the component crops grown in mixture with millet.

One of the criticisms associated with the use of the function is with regard to the number and type of crops in mixture with millet. For example the total output of millet with component crops in mixtures like garden eggs, pepper; tomatoes etc will be an over statement of the total output of millet which the input output relationship of the component crops cannot be separately determined by the function.

Among the three functional form discussed in this paper, the Cobb-Douglas functional form has used more often by researchers because it satisfy their economic, statistical and econometric criteria of their study then the other functional forms (Ekpebu, 2002). Some of the advantages of the Cobb Douglas production function are that, it is easier to estimate the frontier function parameters and it provides not only direct measure of the efficiency of the individual inputs of the firm but also provide a direct measure of the overall efficiency of firm.

Researchers that have use it include Alfred Ockija and Allison-Oguru (1989); Ajetomobi, et al (1998); Ekpebu ?(2002); Koko (1997).

In production function analysis researchers related the physical inputs to the physical output. That is to say, the output and all the variable inputs should be expressed in physical terms.

FUNCTIONAL FORMS COMMONLY USED

According to Ekpebu (2002), there are many functional forms that could be used to describe production relationships, but in practice the commonly used forms are linear, quadratic and Cobb-Douglas functional forms.

DISCUSSION ON THE COMMON FUNCTIONAL FORMS

The linear production function is used to measure linear relationships between inputs and outputs. For two variable inputs, the function can be mathematically expressed as:

$Y = a + b_1 x_1 + b_2 x_2$

Where Y = Output

X_1 and X_2 = Variable inputs

b_1 and b_2 = the parameters to be estimated and they determine the level of efficiency of the inputs on output; and

a = constant

According to Kalaitzandonakes et al (1992) the linear function is not a good measure of an optimum because the coefficients assume constant marginal productivity.

The quadratic function is used to measure the direct effects of inputs on

output. It has the advantage of being differentiated twice thus making it possible for first and second condition for optimisation to be established (Olayide and Heady. 1982). For two variable inputs the quadratic function can be expressed as:

$Y = a + b_1 x_1 + b_2 x_2\ b_3 x 2_1\ b_4 x 2_2 + b_5 x_1 x_2$
Where Y = level of output
X1 and X_2 = variable inputs
b_1 and b_2 = the measure of the direct effect of the level of inputs on output
b_3 and b_4 = the measure of the rate of change
b_5 = the coefficient of interactive effect; and
a= constant term

Uptom (1979) stated that the quadratic function can never show both marginal product at low levels of inputs and decreasing marginal product at higher levels of input in the same equation.

The Cobb Douglas production function is used by researchers more than the linear and the quadratic functions. Heady and dillion ( ) stated that in agriculture the model has been applied to single enterprise farms, multiple enterprise farms and to single enterprise farms existing on multiple enterprise farms. Doll (1974) observed that this diversity suggests that the underlying assumptions might be quite different. He further stated that users of the function will not always state the assumptions needed to justify their economic analysis, thus leaving the reader to read from backwards the underlying economic models. For two variable inputs the function can be expressed as:

Y	=	$AL^{b1} K^{b2} e$
Where Y	=	level of output
L and K	=	variable inputs
a	=	multiplicative constant
B_1 and b_2	=	the coefficient of L and K and they represent the direct measure of elasticity of the respective factors of production; and
e	=	error term

The sum of b_1, and b_2 indicate the nature of returns to scale. Upton (1979) stated that, the Cobb Douglas production function cannot show both increasing and diminishing marginal productivity in a single response curve

and as a result it does not give a technical optimum and may lead to the over-estimation of the economic optimum.

Despite these disadvantages researchers still find the Cob Douglas production function useful in analysis survey data where many variable inputs are involved and it is necessary to measure returns to scale, intensity of factors of production and overall efficiency of production. It can also provide a means of obtaining coefficients for linear programming models and budgets. It can also provide a means of obtaining coefficient for testing hypotheses (Cobb and Douglas 1928: Erhabor, 1982).

According to Olayemi and Olayide (1981) the error term in the production function can be omitted since on the average the residual error is assumed to be zero.

CONCLUSION & RECOMMENDATIONS

From the discussions in this paper, it is obvious that the three commonly used production functions are the linear, quadratic and the Cobb-Douglas production functions while the Cobb-Douglas production function is used more than the other two because it satisfies the economic, statistical and econometric criteria of many studies than others.

This paper also show that some researchers do not express all their variable inputs in physical terms for use in any production functions.

The following recommendations are therefore made:

i) Researchers should consider first the three decision rules as stated by Yotopoulos (1967) before making a choice of the functional form to use.

ii) Researchers should ensure that all the variable inputs ans output should be in physical terms if we want to establish the true meaning of a production function.

iii) Researchers should also ensure that the choice of nay functional form satisfies the economic, statistical and econometric criteria of that particular study.

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AN ECONOMETRIC ANALYSIS OF STABILITY OF REAL WAGE IN NIGERIA [1970-2002]

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ABSTRACT
One major feature of real wage in most developing countries is instability. The scale and scope of this however differ from country to country. In this study an attempt is made to determine the scale and scope of this instability by defining and selecting a time expansion path using difference equations. Time-series data on median wage in the public sector were employed to fit a regression using Two Stage Least Square 2SLS. In the process it was observed that the real wage time path is best described by a quadratic function with single maximum, which declines monotonically. The paper is concluded with a policy recommendation.

INTRODUCTION
Nigeria has had an extensive experience of wage movement spanning more than four decades of part independent era, when government began to employ wages commission/tribunal and committee in setting wages for its workers. But the earliest most prominent, formal and direct were those of Morgan Commission of 1964, Adebo Commission of 1971, Udoji of 1975, Cooky Commission of 1980 and Onosode (1982) Adamolekun (1983) apart from those that were fixed by administrative fiat and military decree in 1995 and 1999.

These commission and those of the recent years have served as the springboard for raising the share of workers in the real national income. It has also served as a platform for the formation of many ad-hoc and spurious groups who exist mainly to articulate the relative deprivation of inequality, in remuneration of the workers in groups and to outwit other competing groups.

Interestingly, these groups have raised wages and have added to an unending competition among income group. However, it has aggravated the rate of inflation (see appendix 1) by inducing price setters to set prices that are not related to increase in wages. The attendant effect of this reflected in the stability of real wages. While the wages increases, the influence of price

movement at rate over the increase (wages-price guide post) wage dampens the net effect of the wage, with the effect that the wage income (proposed as far back as Morgan era and articulated in second National Development Plan) continue to nosedive. Subsequently, it is expected that public policy will return the real wage to its expansion path or at least maintain it at a real term (Ojegbile 1986), but a general decline is the common feature. The situation is further heightened by the current globalisation of finance and governance which had made Euro, Pound sterling and American dollar as a yard stick or benchmark for measuring other currencies of the world. African countries and indeed Nigeria had her currency peg-down to dollar. The attendant effect of this is a reduction in the purchasing power parity of Naira with the effect that exports is made cheaper and import more expensive. As a result domestic prices are artificially high and heightening the inflationary problem and distorting real wage.

This paper therefore focuses on the stability of real wage with a view to estimate the trend and determining the expansion path of real wage in Nigeria. The analysis is limited to the public sector partly because public sector wages earner represents about two-third of the wage earning population of the wage earning population and partly because wage adjustment in the private sector tends to follow those of the public sector (Fashoyin 1986). To achieve this objective, the rest of this paper is organised in to four sections. Section II presents the conceptual and theoretical background, while in section III the model for the analysis are discussed Section IV discussed the major finding, their implications for public policy and concludes the study.

II. Conceptual and Theoretical Layout.

Stability of real wage can be conceptualised from two perspectives. The first can be seen to mean a state of equilibrium in which the growth of real wage return to its original level when ever there is a change in its nominal value. The second could mean variability or dispersion of annual earnings. In both cases, stability or instability refers to unevenness in real wage growth path representing a long period of stagnation and sizeable decline in real wage even when wages have increase normally two distinct and interconnected factors are responsible for the character of annual earnings and their stability or otherwise. The first is the structure of the form of formal/informal. The formal component comprises of wage employment in the public sector and organised private sector the public sector employment constitute about two-third of the wage employment with the government

exercising a leading duopsony in the demand for labour. The informal section is largely on regulated with wage being determined along the professional line and whose elasticity of income security is very low.

The second factor is composed of stochastic factors which overtime shifts the structure of wages. Such factors include changes in economic environment in particular prices of raw materials, changes in investment pattern, changes in the world prices of manufactured inputs and other allied products. It is pertinent to note that both systematic and stochastic factors have serious implications on the stability or otherwise of real wage in Nigeria. This is because, unlike some countries like Belgium, Luxemourg France and a few other developing countries, where wages are indexed to the consumer price movement, wage adjustment typically takes places after a very long and unspecified period and often by administrative fiat without any recourse to any bench mark or systematic or stochastic factors.

Enwere Dike (1996) traced the persistent occurrence of and stochastic factors to the character of Nigerian economy, which is typically dependent: and relying principally on single or very few export staples, whose export prices tend to fluctuate but declining in the long run, narrow industrial base. so that capital goods and technology originate in imports and severally constrained foreign exchange budges. In effect, it limits the inflow of capital good and technology, thus making it inherently difficult to source foreign exchange at the on-going exchange rate.

The cumulative effect of this can manifest in either of the following:

(i) Increasing cost of production thus forcing producers to set commodity prices beyond the wage increase.

(ii) Reduction of wage employment in the public sector, occasioned by increasing labour cost (Adenikinju and Chete; 1997).

(iii) Because the labour market is already polarized into public/private or formal/informal on the other hand, allocation of labour to the private or informal sector will remain at sub-optimal level,

(iv) Overtime capital intensive technologies are adopted in view of the distorted relative prices (Todaro 2000).

Though the forms and procedures for wage determination/review differs from country to country the machinery employed will fall into either or a

combination of legislation, wage board/commission, national advisory board, collective bargaining, conciliation and compulsory or voluntary arbitrage. Nigeria in particular has used virtually all these in the process of wage review especially in the public sector.
However, from the theoretical point of view three approaches are mostly adopted. These are the neoclassical theory of labour market, the subsistence wage theory and the structuralist theory of labour market.

In the neoclassical theory, which is premised on the individual as labour market agent, the mechanism for wage and employment determination is based on the aggregation of these independent decision-makers. In this respect, each worker is faced with a constrained utility maximization decision. From the demand side the neoclassical theory presupposes perfect substitutability between productive factors and employers of labour are driven by profit maximization to hire workers until the productivity of the last paid worker is equal to the wage. Given the state of technology, the higher he wage rate, the lower the employment> Hence, the demand for labour is a decreasing function of real wage paid.

The interaction between the demand and supply determines the equilibrium. If for any reason, there is a fall in demand over supply, the resulting involuntary unemployment will reduce the real wage since there is a give level of employment that could be accommodated by the level of output, to raise real wage therefore save other methods may have to be applied. In Nigeria, wage tribunal, commission or the agency of government fixes the wage without resources to an economically visible benchmark. Rather, it is premised on the socio-political pressures imposed by workers on their agents on government.

The structuralist theory on the other hand stands poles apart from the neoclassical theory. It identified two components: the formal and the informal. The pay in the informal sector is not in terms of wages but in most ease, in the form of sales proceeds. In the formal sector, prices are based on production cost while wages in the informal sector plays a considerable part in the determination of formal sector prices. The formal sector also influences the prices of similar goods and services in the informal sector.

By and large, the formal, sector production determines the prices charged by the formal sector. In the structuralist theory the minimum wage establish determines the direction of the real wage.

On the whole, in the neo-classical theory assures perfect competition between labour and firms, consequently no one party is strong enough to influence the wage except and of course through the cohesion of the workers representative or through the coalition of employers association. This has the usual trend in view of the prevailing shortages or lost of openings, which makes mobility difficult within the industry and without the industry.

The Model

This study applied a first order difference equation to model a typical neoclassical labour market model of the form.

DL	=	a + b W/p	a, b>0	(1)
SL	=	c + d W/p	c,d, >0	(2)
And W/p	=	(DL SL)		(3)

Where DL = demand for labour
SL = Labour supply
W/p = real wage

As noted earlier, the study attempts to determine the shape and character of the expansion path of the real wage between 1970 and 2002 to determine the factors that best defines the observed pattern. To this end it is required to formulate models, which attempt to capture the character of growth path of real wage.

Post a function incorporating the factor that shaped the growth path

Let W/p = W/p (t) .... (4)

Here the real wage is expressed as a direct function of time (t)

We define

W/p (t) = (W (0) W)e^{rt} (5)

Where W (0) is the median wage per annum before tax.

W (t) is the mean wage for the period

If W/p (t) = W (t)

Then, W (t) = W

This implies that for stability, we expect the real wage to coverage as (t) expands.

Let (W (0) W) = A (6)

So that W (t) = Ae^{rt} (7)

The dynamic stability of the real wage will depend on the term Ae^{rt}

The independent variable t will assure values 1,2,...n (n = 31 years)

For the period analysis, we re-specify equation 7.1 in the form:-

W (t) = a + be^{t}

Where (a) is he constant of the function, b is the coefficient to be estimated

and e is 2.7183. the natural log. The model assumes a linear growth path so that the real wage is even overtime hence dw/d (t) = b.

It is further assured that there is no dispersion or instability overtime so that dw/d(t) =0.

As t assures high values overtime there will be an unbroken corresponding upward surge in the growth of real wage.

Other versions of 7.1 could be of the form:-

$W = a + bt$ (7.2)

$W = ab^t$ (7.3)

$W = ae^{bt}$ (7.4)

$W = a + bt + ct^2$ (7.5)

$W = a + bt + ct^2 + dt^3$ (7.6)

For the models (7.2) to (7.4) we assumed that the growth process is exponential but smooth so hat there are no abrupt disruptions in real wage growth rate is monotonically increasing.

A in the model is multiplication constant which produces a scale and minor effect. Without changing the basic configuration of the time path. The sign of A on the other hand affects the shape of the time path because y bt is multiplied by A = -1, then each time path will be replaced by its own image with reference to the horizontal axis. Thus a negative produce a mirror effect as well as the scale effect (Alpha changing....). on the other hand the role of b can be summarized in the following general statement.

The time path of b^t (b (0) will be

Non oscillatory } if {b >0

Oscillatory } {b <0

Divergent } if {/b/ > 1

Convergent } /b/ < 1

It is important to state that, whereas the convergence of the expression ert depends on the sign of r, the convergence of bt expression depends instead on the absolute value of b.

Below is a table of selected time path of the real wage

W	$= a + bt$	$Dw/dt = b$	$D^2w/dt^2 = 0$
W	$= ab^t$	$Dw/dt = ab^{t-1}$	$D^2w/dt^2 = a(t-1)db^{t-2}$
W	$= a + bt + ct^2$	$Dw/dt = b + 2ct$	$D^2w/dt^2 = 2c$
W	$= a + bt + ct^2 + dt^3$	$Dw/dt = b + 2ct + 3dt^2$	$D^2w/dt^2 = 2c + 6dt$

III (b) Model of Real Growth Path.

The growth path of real wage in Nigerian public service can said to be a function of a number of factors:- Price index (p) which is a function of the

demand and supply of the output of goods and services: inflation rate (f) which is itself a function of the general rise in the price level and exchange rate (e) which is a function of the demand and supply for foreign exchange because of the import dependent nature of the production system and other stochastic variable: like the socio-political environment captured in a functional form. the change in real wage can be expressed as:-

$DW/p = f(DP, DF, DE, DS) \ldots (8.1)$

Expressing this equation form value

$S(W/p) = f)dp, df, dE\ ds)$

$\text{Log } d\,(W/p) = a_0 + a_1 \text{ long } dp + a_2 \log DE + a_3 \text{ Log } ds + Ut$

Where a_1, a_2 and a_3 are th coefficient to be estimated note that a0 represents the influence of random variable not captured by dp, df, de and ds. The instability of real wage growth path is believed to be a function of the following variables.

$D^2(W/p) = f(d^2p, d^2f, d^2e, d^2s)$

Where d^2 refers to the second derivative in the variables or the stability of change in the variables. The functional form of equation (a) is of the form.

$\text{Log } d^2(W/p) = \text{Log } a0 = a_1$

$\text{Log } d_2p = 8_2 \log d_3f + a_3 \log d_2E + a4 \log d_2S\ u.$

IV Data Measurement and Estimation Procedure

Most of the data employed for the study are aggregate data and are measured in rates. The wage rate is the rate of change of the median salary of worker in the public service between 1970 and 2002. this is the years for which relaiable data can be obtained. The salary is first deflated by the consumers' composite price index with 1996 as the base year: This is obtaining from the annual abstract of statistics of the Federal Office of the Statistics (FOS), the Exchange rate indices is obtained from the statistical bulletin of the Central Bank of Nigeria. The exchange rate indices is obntained from the statistical bulletin of the Central Bank of Nigeria. The socio variable is here held as dummy, measured, as 0 for the years not affected or 1 for the years affected.

Before any sensible regression analysis can be performed, it is high essential identify the order of integration of each time series (Variable), provided of urse, that the variable can be transformed into a stationary variable rough differencing. The variables were tested for stationarity and unit roof as is fundamental to the analysis of economic time series. This is because most statistical influences and modelling techniques rely on the assumption concerning the existence of unit roots. The theory and practice of testing for stationarity and unit roots have produced numerous approaches, but in this

study in the last we have employed argumented Dickey-fuller stationarity test (see mill 1993). The test shows that first difference is all that was needed to bring the variables to stationarity.

In a straight-line growth path $d^2 = 0$. This implies that there is a stable growth path. The equations for estimation are (7.1), (7.2), (7.3) and (8.1). The estimated regression equations regrouped are 7.1, 7.2, 7.3 and 8.3. Equation 8.2, though mentioned was not reported because of little or no significant difference between 8.1d and 8.2 except 8.2 should slight difference in the size of the price index parameter for the two sample periodis estimated differently.

Empirical result

W_t = 24.3 - 0.12t
(220.9) (-2.0)
R^2 = 0.86, DW = 2.06 F=13.6
dw/dt=0.12 d2w/dt2=0

7.3 Wt = $3.467t^{0.1132}$
R^2 = 0.96
DW = 1.09 F = 31.4
dw/dt = $0.392t^{-0.8868}$
d2w/dt2 = $0.3476t^{-1.8868}$

7.4 W = 2.45 + 0.69t 0.0088t3
(1.04) (7.19) (-1.07)
R^2 = 0.94 DW = 2.08 F = 124.23
dw/dt = 0.69 0.0176t
d^2w/dt^2 = 0.176

7.5 W = 42.33 -0.0090t + 0.0945t2 (-1.16)
R^2 = 0.93 DW =2.11 F=52.96
dw/dt = -0.009 + 0.189t 0.00174t^2
d^2w/dt^2 = 0.189 - 0.00348t

Figures in parenthesis are t statistics.

8.1 logs (W/P)t = 0.09 logs (pi) 1.198 logs (Fi)
(1.13) (2.76)
- 0.912 log & (er) + 0.078 log & (SE)
(#.72) (2.6)
R^2 = 0.96, DW = 1.22 F = 49.6

(The intercept term is not significant, so it was suppressed.)

The equations were estimated over the sample period 1970-2002 The period for which reliable data are available. The sample period was broken into two, 1970 1985 and 1986 2002. the frequency of points in this sample period is annual the method used was two stage least squares. The reason for this is because of nature of most time series data. All parameters were correctly signed and the inferential statistics are reliable. The test of stability, parameter signed and the inferential statistics are reliable. The text of stability, parameter constaney, (using sealed recursive chow test statistics) are both acceptable for equations 7.1 to 7.5, the only exeption is the case of equation 8.1 and 8.2 where the price index showed different parameter for the two sample periods estimated separately. This is to be expected in view of the fact that price is also a denominator of the exogenous variable (W/P) just as it is also an endogenous variable. The inclusion of a lag dependent variable did not make a difference.

Since the data employed for this study are time series data, they are tested for statioiarity and presence of unit-root using Adjusted Dickey Fuller Test. (ADF) (Mills, 1993).

Similarly, all parameters except the coefficient of P! in equations 8.1 and 8.2 are significant at 5% level. The result obtained in 7.1 does not mirror the true character of real wage movement in Nigeria, during the period under review. Equations 7.2 to 7.3 are exponential function. Neither of these describes the time path of the real wage. Movement, since all of them suggest a unimodal maximum, which begins to decrease downwards, and diminishing returns sets into the growth process. This may not be typical of any real wage, growth pathand as result only equation 7.2 is here by reported.

Equation 7.4 is a quadratic expression of the real wage time pat. It suggests that depending on the coefficient of the term t^2, the curve may increase to a maximum or decrease to a minimum. A negatively signed coefficient of t^2, as is the case here ($-0.0088t^2$) shows a rising but negligible growth path while a positively signed coefficient (i.e $t^2 > 0$) indicates a decreasing to minimum. This is typical of the period between 1970 and 1985. the feature is observed in the test of stability for the time series data employed for this study. Between 1986 and 2002, the result obtained indicated a $t^2 > 0$, implying that the real wage had been on the decreasing path, and falling

monotonically below the minimum.

Fig. 2 below shows the time-series graph of nominal wage for junior category over the review period

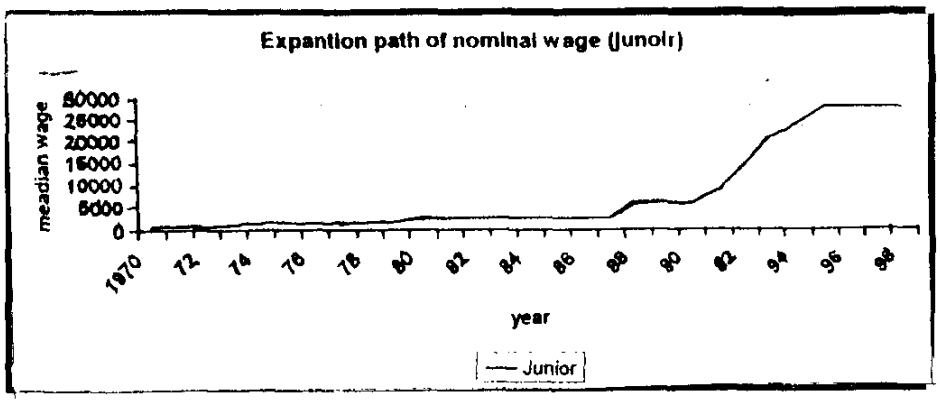


Fig. (2a) Expansion path of nominal wage of junior category of workers.

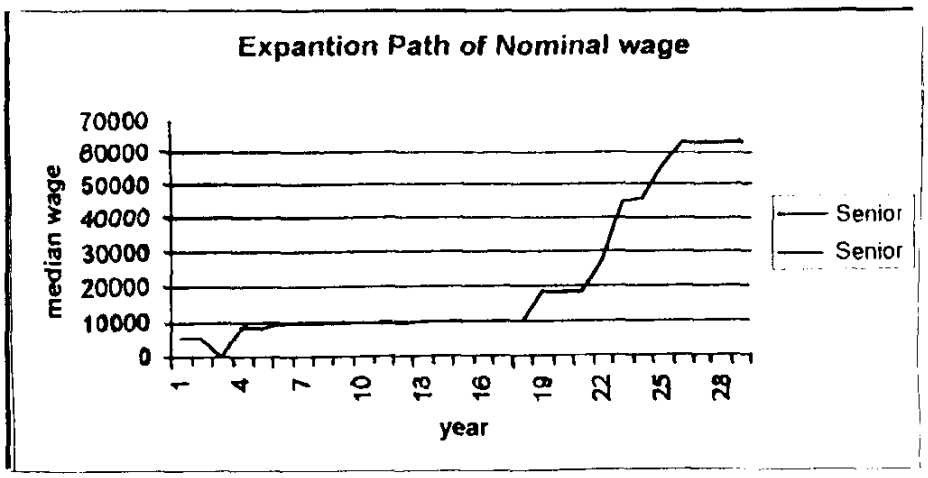


Fig. 2 (b) Expansion path of nominal wage for senior category of workers.

Between 1970 and 1980, the nominal wage rise steadily and stably. It has a slight jump between 1981 and 1987. this little jump coincided with the wage increate of 1998. Since 1990, the nominal wage has been on the increase on an annual basis but became stable between 1995 and 2002. the same trend was exhibited by senior category of workers. Relative instability of nominal wage started in 1988 but had risen in a step-wise till 2002.

Figure 3 below (a) which shows the explanation path of the consumer price index also exhibited the same pattern as in figure 2a and 2b.

role in motivating their employees through the following:

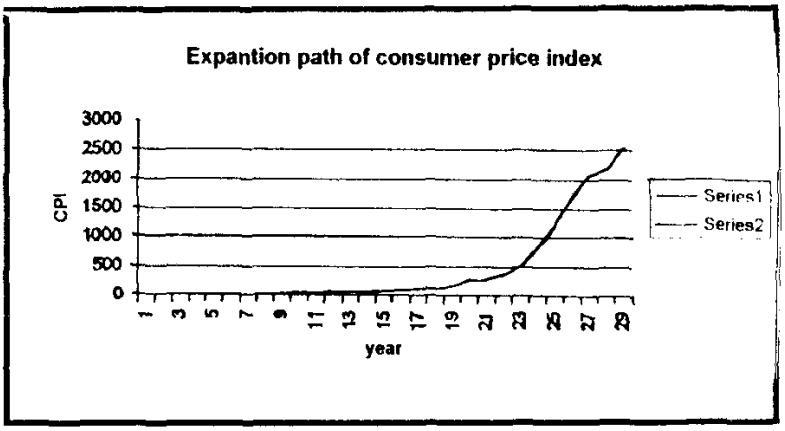
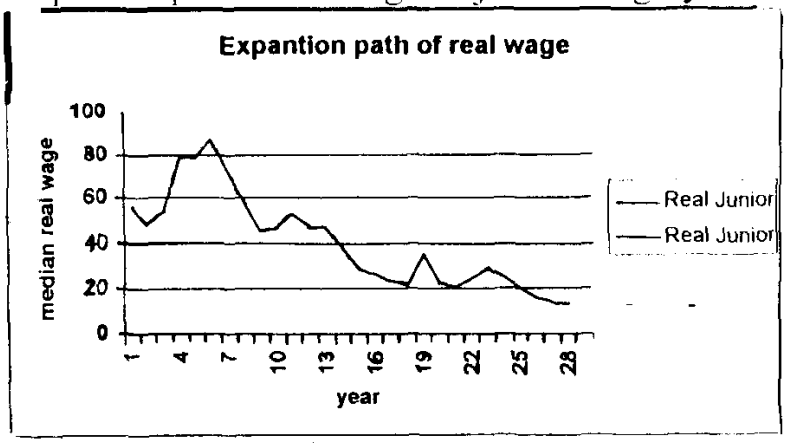


Fig. (3) The time path of consumer index (CPI)

Fig. (4a) Expantion path of real wage for junior category of workers



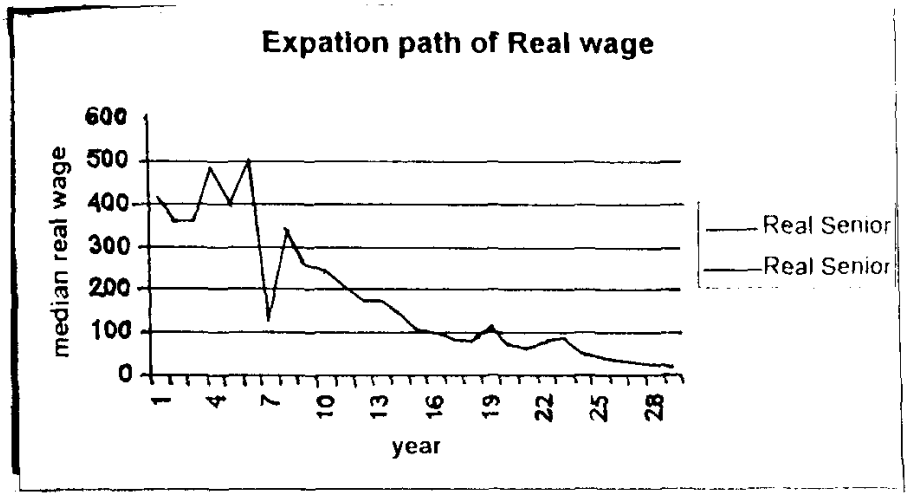


Fig. (4b) Expansion Path Of Real Wage For Senior Category Of Workers

Figure 4 (a) and (b) represent the expansion path of the real wage from the period under review. Real wage rose steadily from 1971, reacling a peak in 1975 and with progressive decline till 1979. There was an insignificant rise in 1980, which declined monotonically. There was a local maximum in 1988 with a sharp decline. which continued till 2000. the path represent an instability of real wage over the review period.

Over the review period the successive wage increases have marginally added little or nothing to the growth of real wage. For instance with a constant of 24.5 and t = 3.92, the real wage has just grown by only 27% between 1970 and 2000. this picture is a radical departure from the growth in the money wage for the same sample period. Equation 7.5. which is a cubic function will attained a variety of shape when expressed graphically (see fig. 4a) Result obtained cast doubts on the admissibility of such a time path for real wage in Nigeria. It suggests an unstable growth path rising, falling and rising to global peak and then declining sharply even below the real minimum/benchmark.

From the foregoing, a quadratic function best describes the real wage time path. The result obtained here further reinforced the view that Nigerian workers are endangered specie with real income declining monotonically, even below the African average growth rate of 38.8%. (See African Development Bank 2002/2003). The attendant implication of this is a trend-decline in productivity occasioned by the inability of workers to operationalise their basic need with relative ease. This no doubt accounted for the persistent clamour by the trade unions for wage increase.

Equation 8.1 is formulated to determine the factors responsible for the growth instability/stability. The results obtained are as follows. The data employed for this study are time series data. By the nature of the equations in the model, it is tempting to employ the ordinary least square method to estimate the equation. However because of non-stationarity of most time series data such an exercise will produce spurious result. This is done by estimating $\delta wt = \delta wt\ 1 + et$. Which is an equivalent equation to $Wt = a + bt$
The equivalent equation is written in the form
$Wt = (1 + \delta) w_{t-1} + e_t$
Where $P = (1 + \delta)$ with the effect that if & is negative, P becomes smaller than one.
Rejection of hypothesis: $\delta = 0$ Acceptance hypothesis $\delta < 0$

The decision rule is however guided by the DF t table. If the computer students t statistics is smaller than the lower critical value for a particular number of observations (n). the null (unit root) hypothesis has to be rejected and the alternative of stationarity of wt accepted. If the calculated students t statistics is greater than the upper critical value. the null hypothesis cannot be rejected.

i.e If 't' < DFL^{n} = Reject

If 't' > DF^{u}_{n} = Accept

If DFL^{n} < 't' < DF^{u}_{n} = Inconclusive.

In this study, the result shows that all the parameter are significant at 5% confidence limit, with a good fit estimater 76%. However, the result suggest serial correlation as shown by Durbin Watson statistics of 1.22. This is not unexpected as we expect the exchange rate to influence domestic price, which are tools in the computation of price index and inflation rate. Notwithstanding this, the result is hereby reported. Contrary to a priori expectation, the influence of price is very minimal possibly dampened by the inclusion of inflation rate and exchange rate in the specialization. The performance of inflation rate and exchange rate indicate a decling tenderancy in the wage, owing to the signs and magnitudes of their parameter.

CONCLUSION

This study echoed some styllized facts. which will constitute our conclusion:

1. The sources of instability in real wage are the instability in macroeconomic prices. In particular, the instability of exchange rate and inflation rate brought a high degree of uncertainty to the value of real wage.
2. The decline of real wage has implications on workers ability to operationalize their basic needs. This inability will be reflected generally in the productivity growth rate. Current trend in the general decline of productivity is indicative of this problem. Therefore employers of labour must put in place some mechanisms that will recognise the peculiar nature of real wage movement and the factors accounting for this movement.
3. It is instructive to suggest wage indexation and monitization of fringe benefits in the sort run to mitigate the adverse effect of decling trend, apart from stabilizing the real wage and reduction of labour cost in the public sector.

4. in the long-run it may be necessary to find ways of influencing some macroeconomic price that distorts the cost of production, such prices like the interest rate, exchange rate and rent must be re-positioned. For example the rate of interest, which currently stood at 34% can depress wage from demand side. This is unlike the U.K and EU countries that have slashed interest rate to as low as 1.5%.

5. There is also the need to find a parity value for domestic currency against dollar that has become the bench mark for the World currencies. This becomes necessary in view of the impact on cost of imported raw material for domestic production and in some cases the cost of imported consumer goods. Relative stability of the factor determining the of real wage will stabilize the real wage. This could be achieved through the design a national wages and income policy which will be as comprehensive as possible, particularly in giving equal shares of the burden of the stabilization policy to wage and non-wage earners, whether or not they are in wages employment.

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