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Effect of Health Status on the Choice of the Volume of Working Hours in Cameroon

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Abstract: This article highlights the influence of health status on the choice of the volume of working hours in Cameroon based on data from the fourth Cameroonian Household Survey (ECAM IV) conducted by the National Institute of Cameroon Statistics during 2014. Health is measured by a subjective indicator of self-assessment of health status. The structure of the distribution of working hours by sector of employment led to the choice of a Tobit model. The results suggest that individuals in poor health (relative to those who are healthy) lose an average of 10.87 hours of work. The fact that health status is not a relevant variable in explaining the working hour's choices of Cameroonians contrasts with the results of other studies which consider health status as an exogenous variable. This article shows that the higher the income from activities, the less time people spend in the labour market. This observation is more noticeable in paid employment, where we observe that the degree of negative influence of income generated by the activity is more significant, at the 1% threshold against a 10% threshold in self-employment. This result reflects the superiority of the substitution effect over the income effect.

Keywords: Health Status, Volume of Working Hours, Cameroon, Tobit

1. Introduction

According to Weil (2008), there are several channels through which health affects the choice of the volume of working hours [41]. In terms of the productivity channel, poor health is likely to have a negative influence on an individual's job performance and lead to reduced working hours [7]. Regarding the preference channel, poor health is likely to increase the marginal utility of time spent outside the labor market, especially that required for seeking care and therefore reduce the number of hours worked [16]. With regard to the health cost channel, an interpretation of the theory of human capital suggests that health could be endogenous to the supply of hours of work. To improve or maintain health, individuals need to invest in their health, which requires material resources and time [15]. It is also possible that the stress generated by a job and the conditions in which certain activities are performed lead to deterioration of health ([33, 34, 39, 25, 42]).

However, it could also be that the specter of a reduction in income or loss of a job encourages individuals to work normally and therefore, poor health has no effect on the number of hours. of work. Better still; the need to seek health care following a health shock can cause an individual to work more, so as to have sufficient means to meet this demand for health care. Consequently, the exact meaning of the influence of health on the number of working hours has not been established [12], even if most empirical studies find a positive influence [27].

Empirically it has been shown that the demands of the job in terms of working hours can have harmful effects on the health of workers. As a result, stress at work, that is, a situation where the worker faces high demands, but without the resources to meet them, is associated with a 23% increase in the risk of coronary heart disease [10], and 30% of the risk of stroke [14]. In addition, emulation and the desire for gain by pushing individuals to surpass themselves can lead to the destruction of health capital [2]. In addition, Dasgupta (1993) argues that an individual's physical ability to work long hours is strongly linked to their physical potential [9]. Research on sugar cane cutters in Colombia [35], coffee pickers in Guatemala [20], agricultural workers [11] and in factory workers [32], in India, show that there is a close link between health status (measured by body mass index or oxygen

consumption) and productivity.

Several works are interested in Africa. Using household data from 1994, Mwabu (2007) shows that morbidity due to malaria in Kenya negatively affects the working hours of men and women in the neighborhood of 15-16% [30]. Kamgnia (2007) finds that in Cameroon, malaria negatively affects the number of hours and days worked by almost 75% [23].

Following Alma Alta's conference, Cameroon is shifting its policy towards primary health care. The actions carried out focused on improving the supply of health care through the construction of provincial, departmental and district hospitals, the fight against major public health endemics like malaria; leprosy, blindness... against chronic diseases such as high blood pressure, diabetes, cancer, asthma and against epidemics including cholera, measles, meningitis...

During the 1986 economic crisis, Cameroon embarked on a series of economic and financial reforms aimed at restricting the state of life. The consequence has been the slowing down of the dynamics of strengthening health structures. With the preparation of the sectorial health strategies document in October 2001, Cameroon embarked on a series of reforms aimed, inter alia, at reducing the mortality of vulnerable groups and the overall disease burden. In terms of mortality, it stagnated among men between 1998 and 2004 at 4.4%. Among women, it went from 3.5% in 1998 to 3.9% in 2004. The poor level of health care of individuals could not only be explained by their low income levels, but also negatively influenced the choice of volume of working hours.

While nearly 56.3% of the employed population works less than 40 hours per week, underemployment, a Cameroonian reality, affects a large proportion of individuals. About 28.3% (respectively 17.3%) of them work less than 35 hours (respectively less than 20 hours) per week (NIS, 2014). These figures, as can be seen, indicate a relatively precarious condition of workers in the labor market. Improving the status of workers is, moreover, a contemporary imperative of social justice, better still, a poverty reduction strategy (World Bank, 1995), which justifies the relevance of this study which aims to assess the relationship between health and volume of working hours using a limited dependent variable model.

In this paper, we contribute to literature in several ways: - a. Using a large cross-sectional household survey conducted in Cameroon in 2014 we use subjective health indicators to assess individuals' health on the Likert 4-level scale in order to analyze the interaction between health and the choice of the volume of working hours. This is because, despite the richness of this survey, information on objective indicators of health such as height, weight and calorie consumption are not included, b. Self-reported measurement of health has been the subject of several studies in the relationship between health and working hours ([6,26]).. However, very few studies have focused on the relationship between working hours and self-reported health, especially in least developed countries. In this study, we attempt to fill this gap by examining the relationship between health and working hours. Because the effects may vary with the nature of the activity, comparisons are drawn between self-employed workers and wage earners, treating sectorial choice as endogenous.

The rest of the article is organized as follows. The next section presents the data sources and methodology. Section 3 is devoted to the presentation of the results and section 4 concludes

2. Data and Methodology

The data used in this work come from the fourth Cameroonian Household Survey (ECAM IV) conducted by the National Institute of Statistics of Cameroon in 2014. It is a source indicated for this analysis in the extent to which it has information relating to the characteristics of the household and its member (age, sex, education, marital status, state of health, participation in the labor market, in particular the sector of activity, income, number of activities, working hours, etc.). This survey covers 12,847 households corresponding to 51,191 individuals.

Due to the fact that the analysis focuses exclusively on the working-age population, we consider any worker between the ages of 18 and 66 to be a worker. The lower bound of this interval makes it possible to avoid taking into account child labour. Because, according to Cameroonian laws, before the age of 18, all employment is considered child labour and the upper limit is set in relation to the retirement age which is set at 66 years. The study being focused on the relationship between health and choice of the volume of working hours, it was necessary to exclude from the sample individuals who undertake full-time studies (i.e. 1,454 observations), and individuals who declared workers, but who did not provide information on their income and who evaluated it at zero (867 observations)

2.1. Measuring Health: A Possible Source of Endogeneity Bias

Establishing the relationship between health and choice of the number of working hours reveals some methodological difficulties relating to the health status indicator. Because of this, it is not easy to measure health. Two main axes have made it possible to measure health status in the literature ([5, 8, and 31]). The first axis is an objective measurement which has the specificity of being observable and comparable. The indicators often used are: the intensity of a chronic condition, the use of medical services, medical check-ups for mental health or the degree of alcoholism, nutritional status (for example height, weight), mortality hoped for or future. The second axis concerns subjective measures. They cannot be observed by the employer or a third party. But only by the employee and the indicators often used are: self-assessments of the state of health for which an individual is asked to assess his health on a Likert scale ranging from "bad" to "very good", the existence or not of health problems that limit the ability to work, and ADL (Activities of Daily

Living) that capture the existence or not of health problems that limit daily activities ([5, 13])..

The standard self-reported health indicator is used in this article. Despite the problems encountered in self-reported health measurement, such as measurement errors and endogeneity, it remains the most widely used health measure. Tausman and Rosen (1982); Jackle (2010) even argued that this measure would be very close to "real" health [37, 21]. In addition, the database integrates the responses of respondents on health limitations; they were asked if they had difficulty seeing, walking, hearing, speaking or other disabilities. A short-term shock is taken into account in this database by a health problem during the last fourteen (14) days, malaria, diarrhea, respiratory infection.

Table 1. *Difference in working hours due to health.*

	Employment		
	All	**Self-employment**	**Paid-employment**
Healthy			
Average differential (Standard deviation)	10,87 (7,51)	11,15 (9,12)	8,41 (9,71)
T- student (df)	3,11 (227)	2,53 (485)	4,15 (359)
$Pr\ (diff > 0)$	0,0278	0,2676	0,0036
$Pr\ (diff = 0)$	0,0095	0,0894	0,0024

Source: Author from the ECAM IV database (NIS, 2014) and using the STATA14 software.

Table 1 shows that, among working individuals, approximately 81.02% report being in good health. A statistical test of difference in means concludes that on average there is a statistically significant difference in the order of 10.87 hours of work between those who consider their health to be good and those who consider the opposite. Taking into account employment, this difference is 11.15 hours in self-employment and 8.41 hours in paid employment. This statistical analysis gives an idea of the influence of health on the propensity of individuals to arbitrate in favor of the labour market in their decision to allocate time. The aim of the econometric explanation is to confirm or refute this statistical analysis.

2.2. Econometric Model

The basic theoretical model relates the hours worked by a given individual (t), and a set of variables (Y_h) which can impact the decision to offer hours of work. The linear specification is:

$$t_i = Y_{hi}\beta_{hi} + \epsilon_i \quad (1)$$

With β_h representing a vector of the coefficients associated with the elements of Y.

According to killingsworth (1983), the methods for estimating models of hours of work supply are organized around two periods [24]. The work of the first period (1930-1970), set out to apply the method of Ordinary Least Squares (OLS). The use of this method leads to biased results in that it does not consider the selection process or the truncated structure to the left of working hours. However, the second period of work finds a solution to these problems by proposing Maximum Likelihood (MV) techniques inspired by the work of [38] or the two-step method of [18]. The works of Killingsworth (1983), Heckman and MaCurdy (1981), Wales and Woodland (1976) and Moffit (1984) provide a critical review of these estimation techniques [24, 19, 40] and [28].

The following structure of working hours:

$$t_i = \begin{cases} t_i^* \ if\ t_i^* > 0 \\ 0 \ if\ t_i^* \leq 0 \end{cases} \quad (2)$$

In equation (2), t_i^* represents a latent value of the propensity to work. We suppose that $t_i^* = Y_{hi}\beta_{hi} + \varepsilon_{hi}$; by assumption, the error terms follow a normal distribution N $(0, \vartheta^2)$. The distribution function $G\ (t/t_i > 0, Y_{hi}, \beta_{hi}, \vartheta_h)$ is defined by:

$$G\ (t/t_i > 0, Y_{hi}, \beta_{hi}, \vartheta_h) = P(t_i \leq t/t_i > 0, Y_{hi}) = \frac{P(0 < t_i^* \leq t/y_{hi})}{P(t_i^* > 0/Y_h)} = \frac{P(-\beta_h Y_h < \varepsilon_h \leq t - \beta_h Y_h/Y_h)}{P(\varepsilon_h > -\beta_h Y_h/Y_h)}$$

$$= \frac{F[(t - \beta_h Y_{hi})/\vartheta_h] - F(-\beta_h Y_{hi}/\vartheta_h)}{F(\beta_h Y_{hi}/\vartheta_h)}$$

Let A_j be a defined binary variable such that:

$$\begin{cases} A_j = 1 \ if\ t_i > 0 \ with\ P[A_j = 1/Y_{hi}] = F(\beta_h Y_{hi}/\vartheta_h) \\ A_j = 0 \ if\ t_i = 0 \ with\ P[A_j = 0/Y_{hi}] = 1 - F(\beta_h Y_{hi}/\vartheta_h) \end{cases} \quad (3)$$

By setting $t_i = A_j t_i^*$, the bias introduced by the truncation is given by the conditional expectation of h_i being give Y_{hi} and A_j = 1 either,

$E[t_i/Y_{hi}, A_j = 1]$. We show that:

$$E[t_i/Y_{hi}, A_j = 1] = \beta_h Y_{hi} + \vartheta_h \frac{f(\beta_h Y_{hi}/\vartheta_h)}{F(\beta_h Y_{hi}/\vartheta_h)} \quad (4)$$

The estimation of non-zero values of working hours on Y_{hi} by the OLS method provides biased and non-convergent estimators of β. Similarly, given the expression

$E[t_i/Y_{hi}, A_j = 1] = (\beta_h Y_{hi})\, F(\beta_h Y_{hi}/\vartheta_h + \vartheta_h\, f(\beta_h Y_{hi}/\vartheta_h)$ if we consider the null values as indicating ordinary choices of hours of work, regression by OLS will also give biased and non-convergent estimators.

If the omission of the selection process of individuals on the labour market makes it difficult for OLS to estimate working hour's equations, Tobin (1958) proposes for the first time the so-called Tobit method in order to correct this insufficiency [38]. The latter now takes into account the selection process of individuals on the labor market on the one hand and the probability that $t_i > 0$ (the distribution of hours being truncated to$t_i^* \leq 0$) on the other hand.

To illustrate this condition, we introduce a latent variable t_i^* such that:

$$\begin{cases} t_i^* = Y_{hi}\beta_{hi} + \varepsilon_{hi} \\ t_i = \begin{cases} t_i^*, t_i^* > 0 \\ 0, t_i^* \leq 0 \end{cases} \end{cases} \quad (5)$$

The estimation of equation (5) by the Tobit 1 model raises two criticisms. First, the model does not provide any theoretical explanation of why the data is censored. Second, the same variables and coefficients explain both the hours of work and the selection process in the labor market. In this study, Tobit 2 which is analogous to [17] model is preferred to Tobit 1, for at least two reasons. First, it allows taking into account that the working hours equation and the selection process are not independent. Second, it is possible to describe the working hours equation and the selection process with different sets of variables and coefficients.

The individual on the labour market must necessarily make a choice from among several options (being an employee or working on his own account), this choice is determined by the indirect utility $U(x_i, j)$ and the individual i will be observed in the employment sector (sec employment) j if we have:

$$secemployment = j\ si\ U_{ij} > U_{ik}\,,\ for\ every\ j \neq k \quad (6)$$

With

$$secemployment = \begin{cases} 0\ unemployment \\ 1\ if\ paid\ employment \\ 2\ if\ self employment \end{cases} \quad (7)$$

Preferences are described by a utility function. Let U_{ij} be the maximum utility that the individual can achieve i if he chooses the sector of employment = 0,1,2; suppose that this indirect utility function can be decomposed into a non-stochastic component (Z_{ij}) and another stochastic (ε_{ij}). We have:

$$U_{ij} = Z_{ij} + \varepsilon_{ij} \quad (8)$$

Where Z_{ij} a vector of individual characteristics is, ε_{ij} is the vector of unobserved variables. The probability that individual i chooses sector of employment j is given by the relationship.

$$P_{ij} = Prob\left[U_{ij} > U_{ki}, k \neq j, k = 0,1,2\right] = Prob\left[Z_{ij} - Z_{ki} > \varepsilon_{ki} - \varepsilon_{ij}, k \neq j, k = 0,1,2\right] \quad (9)$$

Assuming that the stochastic term (ε_{ij}) follows a Weibull distribution, then the difference ($\varepsilon_{ki} - \varepsilon_{ij}$) is a logistic distribution. Thus, an individual will be observed in sector j if $U_{ij}^* = \left(U_{ij} - U_{ik}\right) > 0\ for\ every\ j \neq k$

Taking into account this process of selecting individuals makes it possible to formulate the following model:

$$\begin{cases} U_{ij} = Z_{ij} + \varepsilon_{ij} \\ t_i^* = \beta_{h0} + \beta_{h1} health_i + \beta_{h2} lnw_i + \beta_{hi} Y_{hi} + \varepsilon_{hi} \\ secemployment_i(j) = \begin{cases} 1, if\, U_{ij}^* > 0 \\ 0, if\ U_{ij}^* \leq 0 \end{cases} \\ t_i = \begin{cases} t_i^*\ if\ U_{ij}^* > 0 \\ 0\ if\ U_{ij}^* \leq 0 \end{cases} \end{cases} \quad (10)$$

$\left(\varepsilon_{ij}, \varepsilon_{hi}\right) \sim N(0, \Sigma)$. *The likelihood function to be maximized is defined as the product* $P\left(U_{ij}^* < 0\right) P\left(U_{ij}^* > 0, h_i\right)$.

The variable w_i designates the income generated by the activity (it represents the salary for employees), it is a predicted variable. The estimation of the model (10) gives the structural parameters $\widehat{\beta_h}$ of the vector Y_h of the explanatory variables for the choice of hours of work, including health and income. Because of their endogeneity, the estimation of structural working hours equations uses the predicted values of these two variables instead of the values actually observed.

Table 2. *Definition of the variables retained.*

Variables	Definitions
Hours of work	Hours of work Monthly hours of work calculated from the average number of hours of work per week worked by employees
Health	
Healthy	
Eyesight problems	Subjective health status indicator. Coded variable 1 = if self-assessment = Good or Very-Good and 0 otherwise
Difficulty speaking	Each of these indicators is coded 1 if the individual reports this problem, and 0 otherwise
Hearing problems	
Mobility issues	
ln (Income)	Natural logarithm of monthly income

Variables	Definitions
Education	Highest level of education achieved, 0 = none; 1 = primary; 2 = secondary; 3 = higher.
Age	Age in years
$Age^2/100$	Age squared divided by 100
Union	Union Marital status- Dummy: 1 = married or in a couple; 0 = single, divorced
Gender	1 = if the respondent is a man; 0 = otherwise
Employment	The variable is coded: 0 = unemployed; 1 = Paid employment; 2 = self-employment
Household structure	Number of people aged [1, 5, 6, 14] [15, 17]
Size of the firm	Size in number of employees. The variable is coded: 0 = 1 employee; 1 = 02 to 05 employees; 2 = 06 to 20 employees; 3 = at least 21 employees

Source: Source: Author from the ECAM IV database (NIS, 2014).

Table 3. *Mean and standard deviation of the variables according to health status.*

Variables	Self-reported health	
	Good health	Poor health
Observations	15 200	3 561
ln (Income)	10,87 (0,635)	10,73 (1,112)
Work Hours	172,05 (74,10)	167,78 (74,891)
Age	36,43 (12,234)	38,62 (12,597)
Alone	0,39 (0,49)	0,40 (0,490)
Married	0,61 (0,49)	0,60 (0,490)
Female	0,53 (0,499)	0,55 (0,50)
Male	0,47 (0,499)	0,45 (0,497)
Education		
No level	0,22 (0,414)	0,17 (0,37)
Primary	0,34 (0,475)	0,36 (0,480)
Secondary	0,38 (0,484)	0,41 (0,50)
Higher	0,060 (0,239)	0,064 (0,245)
Employment		
Unemployment	0,372 (0,483)	0,322 (0,467)
Self-employment	0,48 (0,5)	0,51 (0,5)
Paid-employment	0,15 (0,359)	0,17 (0,377)
Children in the Household		
0-5 years	0,44 (0,496)	0,60 (0,490)
6-14 years	0,56 (0,496)	0,40 (0,490)
15-17 years	0,24 (0,425)	0,20 (0,401)
Firm size		
2-5 employees	970,22 (433,68)	923,27 (411,47)
6-20 employees	94,65 (62,68)	103,34 (67,74)
At least 21 employees	111,89 (53,391)	109,23 (52,218)

Source: Author from the ECAM IV database (NIS, 2014) and using the STATA14 software. Values in parentheses are standard deviations.

From Table 3 we observe that on average, individuals who consider their health to be good spend a little more time in the labour market compared to those who consider themselves to be in poor health (an average difference of 4.27 hours per month).

Income distribution is less dispersed among individuals who report being in good health, but the income difference between individuals who rate their health as good and those who rate it as poor is small. The average age is higher in people who believe their health is poor. Therefore, the oldest declared to be in poor health [36]. Among those who report being in poor health, 55% are women and 45% are men. Therefore, women are more likely to report being in poor health compared to men. Self-employed workers are strongly represented but almost in the same proportions (almost 45.5%) in the different levels of the self-reported health.

3. Econometric Results

Table 4. *Tobit results of the working hours equation.*

Variables	Employment	
Variables	Self-employment	Paid employment
No-sick	-0,235 (-0,0884)	0,136 (0,161)
ln (Income)	-0,0411 (-0,0184) *	-0,323 (-0,0321) ***
Age	0,158 (0,0117)	0,212 (0,0230) ***
Age2/100	-0,163 (-0,0145)	-0,226 (-0,0284) ***
Married	0,162 (0,0392)	0,0851 (0,0664)
Male	-0,129 (-0,0375)	0,635 (0,0657)
Education		
Primary	0,104 (0,0575) ***	-0,344 (-0,126)
Secondary	0,540 (0,0619)	0,742 (0,126)
Higher	-1,248 (-0,0954) **	0,766 (0,144) **
Children		
0-5 years	-0,51 (-2,32) *	0,002 (0,17)
6-14 years	0,008 (0,82)	-0,30 (-1,71) *
15-17 years	0,036 (1,54)	-0,038 (-2,36) *
Firm size		
2-5 employees	0,005 (0,40)	0,002 (0,17)
6-20 employees	-0,0002 (-0,0003)	-00005 (-0,0004)
At least 21 employees	-0,0007 (-0,0003)	0,00167 (0,0005)
Constant	-2,286 (-0,283) ***	-10,03 (-0,600) ***
Athrho	1,47 (8,32) ***	3,48 (6,15) ***
Ln sigma	3,27 (51,10) ***	-10,03 (-0,600) ***
Rho	0,80 (22,38)	0,74 (17,20)
Sigma	97,31 (11,62)	107,73 (11,54)
Lambda	79,21 (8,24)	83,01 (6,47)
LR Test of independence of equations (rho=0)		
Chi2 (12)	16,38	8,19
Prob> chi (2)	0,0000	0,0000
N	3 399	3 399
Wald chi2 (9)	11,44	29,26
Prob> chi 2	0,0062	0,0000
Log Likelihood	-1870,84	-3053,14

Source: Author from the ECAM IV database (NIS, 2014) and using the STATA14 software. Note: Dependent variable: Number of working hours; the variables alone, female, no level, unemployed, 01 employee are residual respectively for marital status, sex, education, employment, size of firm. The figures in parentheses are the standard deviations. ***; ** and * are significant at 1%, 5% and 10% respectively. Lambda represents the inverse of the Mills ratio which corrects the selectivity bias, Sigma represents the standard deviation of the residual of the hours equation.

Table 4 shows that overall, the model is globally significant as well as the terms correcting the selectivity bias. The significance of this term reflects the non-independence of the error terms of the selection and working hours equations, thus justifying the use of a procedure to correct the working hours equations of the selectivity bias. In addition, the subjective health status indicator allowed us to classify individuals into two groups: "No-Sick" and "Sick". The first group represents individuals who rate their health as "Good" or "Very Good". The second group concerns individuals who rate their health as "fair" or "poor".

From Table 4, it appears that the state of health is not relevant in explaining the working hours choices of Cameroonians. This article shows that the higher the income from activities, the less time people spend in the labor market. This observation is more noticeable in salaried employment where we observe that the degree of negative influence of the income generated by the activity is more significant, at the 1% threshold against a 10% threshold in self-employment. This result highlighted by [3] reflects the superiority of the substitution effect over the income effect.

Age and level of education have a positive influence on the number of working hours of individuals in wage employment, which is not the case in self-employment. Attachment to the labor market increases with age, at a decreasing rate, and with the level of education. This result reflects the fact that in salaried employment, the level of education is linked to the quality of the job, the responsibilities and the financial benefits of the job. In self-employment, on the other hand, individuals with a higher level of education (compared to those with no level of education) tend to spend less time on trading activities.

In paid employment, having children is only relevant in explaining the supply of working hours beyond 6 years. Below this number, there is no significant effect. As for self-employed individuals, only the presence of a child is sufficient to capture the negative influence of children on the labour supply behavior of individuals on the market.

4. Conclusion

The objective of this study was to highlight the causal link between health status and choice of the volume of working hours in Cameroon. Health is measured by a subjective indicator of self-perceived health. The health-time differential test and the Tobit model were used for statistical and econometric inferences from the secondary data. The results suggest that there is a statistically significant difference in the order of 10.87 hours of work between those who rate their health as good and those who do not. The fact that health status is not a relevant variable in explaining the working hours choices of Cameroonians contrasts with the results of other studies which consider health status as an exogenous variable. But this result is consistent with that of [29].

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