

Fertility, Health and Female Labour Force Participation in Urban Cameroon

Roger A. Tsafack Nanfosso (Corresponding author)

Faculty of Economics and Management, University of Yaoundé II, Cameroon

P.O. Box 6886 Yaounde, Cameroon

E-mail: rtsafack@hotmail.com

Christian M. Zamo-Akono

Faculty of Economics and Management, University of Yaoundé II, Cameroon

P.O. Box 1365 Yaounde, Cameroon

E-mail: zchristy2@yahoo.fr

We wish to thank all the REMA network members for their helpful comments and suggestions. We acknowledge research support from the African Economic Research Consortium.

Abstract

Many studies report empirical relationship either between fertility and labour supply or, between health and labour market outcomes. In this paper, an extension of these ideas involves explicitly considering how fertility and health affect each other, and how they interrelate with labour force participation. A unifying framework is provided and a simultaneous three equations model developed to capture the interdependence between these variables as well as their respective determinants. The model is estimated using a cross-section data set obtained from a survey of the urban Cameroon population. The results indicate that: (i) fertility and health status are significantly interrelated, thus separate estimations of fertility (or health status) and participation will produce misleading results; (ii) working in either sector of the labour market significantly reduces fertility but, unlike many previous studies, fertility has a positive impact on the probability of labour force participation; (iii) there is strong evidence that health and disability status is a significant determinant of employment, but the reverse depend on the labour market sector and on the health indicator used.

Keywords: Fertility, Self-reported health, Labour supply, Simultaneous equations

1. Introduction

Since the pioneering work by Mincer (1962) and Cain (1966), there have been numerous studies on female labour force participation. These studies highlight that women's labour supply depends upon economic and demographic characteristics such as female earnings, male earnings, non-earnings income, schooling, age and the number of children (see Hill, 1983 for a review). Some of the studies have documented strong ties between women's work patterns and changes in their family status (Ellingsæter and Rønsen, 1996; Rosenfeld, 1996; Rindfuss et al. 1999). These results are based on the evidence that women who work for pay have fewer children (on average) than women who do not, and that mothers spend less time in paid employment (on average) than childless women.

As the body of literature on labour supply grew, models were implemented to demonstrate that health was one of human capital characteristics (Scheffler and Iden, 1974; Bartel and Taubman, 1979; Parsons, 1980) and as such, health status variables influence labour force decisions; therefore, models could be refined in order to include these variables. There is extensive literature that demonstrates a positive relationship between health and economic prosperity (Marmot et al., 1991). Using self-reported measures, Bound et al. (1996) found that health has positive and significant effects on labour force participation; they demonstrated that the lower labour force participation rates of blacks in the United States (relative to whites counterparts) can be explained by differences in health status.

While there is evidence that fertility is endogenous to labour force decisions (Cramer, 1980; Mroz, 1987; Angrist and Evans, 1998), Stern (1989) and Leung and Wong (2002) documented the fact that health and labour force participation are interrelated (see also Haveman et al., 1989; Lavy et al., 1995). Yet, most of these studies treat these relationships separately (I mean fertility-labour supply, and health-labour supply) and ignore the well documented influence of fertility and health on each other (see Merchant and Martorell, 1988; Adair and Popkin,

1992; Miller et al. 1994). I argue that failing to account for this relationship may have led to biased estimates of the impact of fertility and health on labour force participation.

The objective of this study is thus to determine the impact of fertility and health on labour force participation in a simultaneous equations framework. The next section reviews the literature, followed by the methodology and the results. The final section discusses the results and concludes.

2. Literature review.

Over the life cycle, female labour force behaviour is governed by various factors. Very complex mechanisms determine the decision to enter, stay on, or leave the labour market (Lelièvre-Gauthier, 1994). These include economic (that is the labour market structure), individual (skills, marital status, labour force attachment, incentives and career expectations), and household characteristics (structure, domestic workload, presence and number of children). Many studies aimed at analysing trends (Chase, 1995; Bonin and Euwals, 2002), economic and social determinants of labour force decision (Benjamin, 1992; Hausman, 1980; Hill 1988, 1994; Saget, 1999; Fong and Lokshin, 2000) either at micro or macro level (See Griliches and Intriligator 1986 for a review). Here, we concentrate on the influence of individual and household characteristics on female labour force participation.

Economists and demographers have been interested on the impact of the *number of children* on how likely is a woman to go out to work, and if she does go out to work, for how many hours (Iacovou, 2001). One may argue that a woman with more children will be less inclined to go out to work, since the time she spends at work will be time foregone with her children, and the expense of childcare will reduce her effective wage. On the other hand, children are extremely expensive, and a mother may have to work more with every additional child to maintain the family income. As a consequence, there is no reason to believe a priori that the effect should go in either direction (or be positive or negative). Despite these arguments, Weller (1977) and Cramer (1980) gave four possible explanations of the association between fertility and female labour force participation: women's fertility influences their labour force behaviour; women's labour force behaviour influences their fertility; a reciprocal relationship exists between the two variables; and the association is spurious, reflecting other factors. If some evidence supports the first three hypotheses, the fourth one has proven more difficult to support. Furthermore, most estimates of this relationship have found a negative relationship between the number of children and a woman's labour supply (see Brewster and Rindfuss, 2000 for a review). The problem with these estimates is that they cannot say anything about causality.

Following Grosman's arguments that "... health can be viewed as a durable capital stock that produces an output of health time" (Grossman, 1972, p.223), it became interesting to query the relationship between an individual's health status and his work behavior. These arguments led to an increased interest among researchers about the impact of health status on an individual's productivity and about the interaction between health and labour market decisions and outcomes. (Note 1). In a study of disability and labour force participation (LFP), Stern (1989) found that disability lowers the probability of LFP, but LFP increases the probability of disability. The finding on the effect of employment on health is not as unambiguous. Ekerdt et al. (1983) discussed the ambiguity concerning whether work improves or deteriorates health. Self-esteem, identity, and personal fulfilments from supplying labour efforts improve health. However, work pressure or poor working environment worsens health. Ross and Mirowsky (1995) found that health is protected by employment and improvements in health increase the probability of employment. Still, most of these studies have ignored the interrelationship between fertility and health status.

Velkoff and Adlakha (1998) stressed the fact that female health problems in India are related to or exacerbated by high levels of fertility. Jejeebhoy and Rao (1995) showed that numerous pregnancies and closely spaced births increase health risks for mothers. Unwanted pregnancies terminated by unsafe abortions, diseases like malaria, HIV/AIDS, tuberculosis, also have negative consequences for women's health. Through the negative effect of poor health on birth outcomes, health status affects fertility. In the context of high fertility rates such as in Cameroon, (Note 2), women are exposed to much fertility related health problems and health matters are likely to determine their fertility choices. Thus, any attempt to determine the contributions of these to variables to female LFP must bear in mind their interactions.

3. Methodology.

3.1 Data source and sample characteristics.

This study seeks to evaluate the impact of fertility and health on female labour supply in urban Cameroon. Information was collected from 2,096 women aged 18 to 64 years, surveyed in Yaoundé and Douala. Many steps

were followed in order to come out with this sample. The first step consisted of estimating the optimal size of the sample of women to survey in each city.

The choice of the sample size was guided by the rule of thumb suggested in sampling theory (see for example Mood et al., 1974) (Note 3) that is, $n = (1.96)^2 p(1-p)/(ET)^2$, where n represents the sample size, p the proportion of individual exposed to the phenomenon studied (in our case, women at the labour force age in urban Cameroon), ET the acceptable error, and 1.96 expressing the choice of a 95% confidence interval. In urban Cameroon, the proportion of women in the labour force age is 50.1% (INS/DSCN, 2001); assuming an acceptable error of 3%, the estimated sample was 1,086 women to survey in each city. We also had to take into account the possibility of incomplete information; due to budget constraints, we supposed we could end up with 5% incomplete questionnaires in each city. This led us to a total of 2,242 women to survey (that is 1,121 in each town). At the end of the survey, some observations with incomplete information were deleted and we ended up with 2,096 observations.

The remaining sample for the analysis comprised (see Table 2) 59.92% of working women and 43.08% not working. Non-working women in each town represented 42.07 in Yaoundé and 44.04% in Douala. Taking into consideration the different sectors of the labour market, it appears that the informal sector has the highest proportion of women (27.3% in Yaoundé and 25.71% in Douala); this result is typical of the Cameroonian labour market.

3.2 Measurement of fertility, health status and labour force participation.

While using the number of children born from a woman to measure fertility, in this study I use two measures of women's health status. The first measure of a woman's health status is obtained from her answer to the following question in the survey: "How would you rate your health: bad, fair, good or very-good?". This is a commonly used indicator in surveys and in models measuring the interaction between health and labour force participation. This subjective measure (labelled *Sub - Health*) is defined as:

$$Sub - Health = \begin{cases} 3 & \text{if } \mu_3 < Health^* < \mu_4 \\ 2 & \text{if } \mu_2 < Health^* \leq \mu_3 \\ 1 & \text{if } \mu_1 < Health^* \leq \mu_2 \\ 0 & \text{if } \mu_0 < Health^* \leq \mu_1 \end{cases} \quad (1)$$

There are a number of concerns with such a measure (Bound, 1991; Tessier and Wolf, 2005). It may not be entirely comparable across respondents, it may not be independent of labour market outcomes, or respondents out of the labour market may mention health limitations to rationalize their behaviour. Such a health measure, therefore, is endogenous to the labour force status and each of the problems just listed may lead to a different kind of bias (Bound, 1991) (Note 4). Despite these and other concerns, this measure is still the most popular measure of health available. Tausman and Rosen (1982) even argued that this measure is close to the "objective" health. But, in seeking for appropriate ways to measure the relationship between women's health and labour force participation, I develop another measure of health status.

The dataset includes respondents' reports of specific health limitations; they were asked if they experienced difficulties with seeing, walking long distances, hearing, or standing long hours. Following the work by Dumont (1999), I define the second measure of health, the *Composite Index of disability (CID)* as:

$$CID^* = \sum_i SRH_i \quad (2)$$

Where, in *SRH* we have the self-rated health and reports of health limitations (I mean answers to the question whether or not they had problems with seeing, walking long distances, hearing, or standing long hours). To construct our index of disability, I reversed the codes of all the measures in order to express poor health. (Note 5). After the summation of these indicators, the obtained index ranges from 0 to 7. This index measures the potential of disability involved in each woman of the sample. It appears from Table 1 that 36.6% of working women have a potential of disability greater or equal to 4, while the same group is composed of 37.7% of non-working women. Then a woman is classified of as "Disabled" if her composite index of disability is greater or equal to four (4), that is:

$$Disabled^* = \begin{cases} 1 & \text{if } CID \geq 4 \\ 0 & \text{otherwise} \end{cases} \quad (3)$$

The most notable difference between developed and developing countries labour markets concerns the economic opportunities available to job seekers. Unlike developed countries where almost all the workers are employees, labour markets in developing countries were first characterised by dualism (see Ranis, 1988 for a survey on dualism) and the last two decades have been marked by the emergence of the informal sector.

In Cameroon, the urban labour market is characterised by two homogeneous sectors (public and formal private) and a non-homogeneous one, the informal sector (Abessolo, 2001). The informal sector comprises self-employed, unpaid family workers and casual workers with reduced job security, hazardous working conditions, and dangerous work environments. Factors determining labour market decisions and outcomes are different from one sector to another. Thus, instead of the usual dichotomy “to work or not to work” observed in industrialised countries and used in many studies, this study generalizes the standard labour force participation model by expanding the set of alternatives to four: working either in the public sector, in the formal private sector, in the informal sector, or not working.

Let us assume that preferences are described by a well-behaved utility function, the maximum utility attainable by individual i if she chooses the participation status j ($j=p, fp, inf, np$), (Note 6), and that this indirect utility function is composed of stochastic (ε_{ji}) and non-stochastic (S_{ji}) components, the indirect utility function is given by Equation 4 and the probability P_{ji} for individual i to choose alternative j is given by Equation 5:

$$V_{ji}^* = S_{ji} + \varepsilon_{ji} \quad (4)$$

$$P_{ji} = \text{Prob}[S_{ji} - S_{ki} > \varepsilon_{ki} - \varepsilon_{ji}, k \neq j, k = p, fp, inf, np] \quad (5)$$

4. Estimation of the Econometric models and results

4.1. Model estimation

The main objective of this study is to determine the influence of fertility and health status on female labour force participation. It explores the contextual factors across various sectors of the Cameroonian labour market using two indicators of health status. We consider the following simultaneous equations model:

$$\begin{cases} Y_1 = \alpha_f Y_2^* + \beta_f Y_3^* + \delta_f X_f + \varepsilon_f & (a) \\ Y_2^* = \alpha_s Y_1 + \beta_s Y_3^* + \delta_s X_s + \varepsilon_s & (b) \\ Y_3^* = \alpha_p Y_1 + \beta_p Y_2^* + \delta_p X_p + \varepsilon_p & (c) \end{cases} \quad (6)$$

Where, equation (a) represents the fertility equation, (b) is the health equation and (c) the participation equation. Fertility (Y_1) is a function of the latent value of health status (Y_2^*), the participation status (Y_3^*), and exogenous variables (X_f); ε_f represents the error term. Equations (b) and (c) are defined along the same lines.

The estimation procedure of Equation 6 involves two steps. In the first step, we estimate reduced form equations (see Equation 7).

$$\begin{cases} Y_1 = X\theta_f + v_f & (a) \\ Y_2^* = X\theta_s + v_s & (b) \\ Y_3^* = X\theta_p + v_p & (c) \end{cases} \quad (7)$$

Predicted values from these estimates ($\hat{Y}_1$), ($\hat{Y}_2$) and ($\hat{Y}_3$) are replaced in the structural equations as expressed in Equation 8.

$$\begin{cases} Y_1 = \alpha'_f \hat{Y}_2 + \beta'_f \hat{Y}_3 + \delta'_f X_f + \varepsilon_f & (a) \\ Y_2^* = \alpha'_s \hat{Y}_1 + \beta'_s \hat{Y}_3 + \delta'_s X_s + \varepsilon_s & (b) \\ Y_3^* = \alpha'_p \hat{Y}_1 + \beta'_p \hat{Y}_2 + \delta'_p X_p + \varepsilon_p & (c) \end{cases} \quad (8)$$

4.2. Description of variables

Female labour force participation is the main focus of this study, with special emphasis on the impact of fertility and health. The information in Table 3 displays a list of variables used in the estimations. Some descriptive statistics of the variables are presented in Table 4. The mean and the standard deviation of fertility are 2.59 and 2.38. A group mean comparison test between working women and those not working shows that working women have more children than those who do not work. The mean and standard deviation of self-reported health are

1.76 and 0.92 respectively. Hence, on average the respondents report a *fair* health condition. (Note 7). The average age is 33.038 years, hence our sample is much younger than (closer to) the ones studied in the literature on health status (fertility) and labour supply. For example, the mean age of the sample studied in Leung and Wong (2002) was 43.1 years, (Note 8), while in the study of Iacovou (2001) the mean ages of the samples were 33 and 35 years. We offer here a brief discussion of some possible relationships between the variables and our dependent variables.

Province: A well-known result in demography states that people from regions with high rates of fertility tend to reproduce the same habits no matter the place they live (urban or rural areas), even if they have migrated to other regions (Locoh, 1988). In Cameroon, people from the northern part and from west province have a high propensity to fertility related behaviour.

While *Deaths* is meant to capture the replacement hypothesis, *Relatives and Child-non-charge* capture respectively the idea that procreation is influenced by the household structure, and the extent to which own-child rearing fees are supported by somebody else (mainly relatives). This practice is common in Cameroon.

Education is expected to exert a positive effect on health at least in two ways. First, it improves health by increasing knowledge and efficiency in the production of health capital. Second, more education may imply higher willingness to invest in long-term capital including health capital.

A problem (14 days) controls for short-term shocks which may affect perception of health. Since health is naturally determined, then after controlling for *long-term disease*, other behavioural variables (such as age and education, to name few) may not determine health.

4.3. Results

The estimation results are presented in Tables 5 through 10. These results are obtained by using a 2SLS procedure. Two different specifications of the health equation are used and presented in all these tables. Specification (1) corresponds to estimates obtained using *Sub-health*, the self-reported health and (2) is obtained using the index of disability (*Disabled*).

4.3.1. The Fertility equation

Fertility is a count data variable and due to over-dispersion estimates is obtained using a negative binomial as suggested by Winkelmann (1997). We used the Consistent Akaike Information Criterion (CAIC) proposed by Gurmu and Trivedi (1996) to compare these specifications (Note 9). This test shows that both specifications do not differ.

It appears from the estimates that tertiary education has a negative impact on parity. This is consistent with the view that education increases the opportunity cost of female employment, and thus changes the objective conditions under which fertility decisions are taken (Ainsworth, 1988; Johnson-Hanks, 2002). Support from relatives in rearing children and the presence of other relatives in the household exert a positive influence on fertility. This result is a confirmation to the fact that, through reduced costs of rearing children, intra-family (and interfamily) solidarities hamper rational microeconomic behaviours (Rwenge, 1999), and leads to high levels of fertility. Health status exerts a positive and significant effect on fertility, but disability status does not. Participation in the labour market exerts a negative influence on fertility.

4.3.2. The Health equations

Health equations are estimated using probit (for *disability index*) and ordered probit (for *the self-reported health*). Our results show that controlling for short-term and long-term diseases reduces the impact of behavioural variables like age and education. Actually, age and health have a non-linear relationship, the disability status increases with age at a decreasing rate; education has no impact either on self-reported health or on the disability status, though from first stage results, it appears that education fosters health by reducing the probability of being disabled. These results are consistent with those obtained by Cai and Kalb (2004).

Fertility has a negative influence on health. It decreases the probability of reporting *very-good* health by 5.2% (while it increases the probability of reporting fair health by 5.8%). As expected, health limitations, long-term disease and problems within 14 days are found to be negatively related to health. Employment is found to be a significant determinant of health. Compared to non-employed women, public and informal workers are less likely to be disabled. Workers of the formal private sector, compared to non-workers, have a 40.4% higher propensity to declare *fair* health, a 14% lesser propensity to declare *good* health, and a 36.3% lesser propensity to declare *very-good* health. The positive effect of public and informal worker status on self-reported health indicates that justification bias is likely to be observed in these sectors. For instance in Cameroon, civil servants

usually justify absenteeism by reporting that they have health problems. All these considered, the influence of employment status on health differs from one sector to another. The negative impact is likely to be caused by bad working conditions and stress.

4.3.3. The Participation equations

The decision to participate in the labour force is influenced by age, education, marital status, fertility, health and the province of origin. There is a concave relationship between age and participation, the highest contribution to this result being observed in the formal private sector. Single women (single, separated, divorced and widowed) have a greater tendency to participate in the labour market than those who live with man (married and cohabiting) do. Relative Risk Ratios (RRR) between these two groups of women are 1.476 for the public sector, 1.718 for the formal private sector and 1.756 for the informal sector; they express greater propensity for singles to supply their labour.

In general, education increases the probability of labour force participation. But, there are differential effects across the various sectors. While the higher the level of education the higher the probability of working in the formal sector (private and public), in the informal sector higher levels of education reduce this probability. Compared to those who did not attend school, having a tertiary education induces a RRR (between working and not working) equal to 7.890 for the public sector, 2.238 for the formal private sector, and 0.172 for the informal sectors.

The origin of the woman has a significant impact of her participation in the private (formal and informal) sector. To compare the influence of the ethnic group of the woman on her choice of the labour market sector as suggested by Lanot and Muller (1997), RRR risk ratios using public sector as the base outcome were computed. These results show that, women from the northern part of Cameroon (compared to those from the littoral) are 25.74% less likely to work in the formal private sector and 30.82% less likely to work in the informal sector. For those from the southern part of the country, the RRR recorded was equal to 41.86% and 64.76% respectively. Unlike these groups, women from the grassroots (western provinces of the country) have a greater propensity to choose the private sector. These propensities are 27.15% and 100.2% higher for the formal private and informal sectors.

As far as fertility and health are concerned, estimates show that, fertility increases the probability of working by 2.4% in the public sector, by 1.7% in the formal private sector, and by 7.5% in the informal sector. Health status is a significant positive determinant of employment, but there are differentials in this influence across the sectors of the labour market. While, self-reported health induces a 2.4% increase in the probability of working in the public sector and a 4.7% increase for the formal private sector, the disability status reduces these probabilities by 8.1% and 22.2% (respectively for the public and private sectors). Influences on the informal sector participation decision are not significant.

5. Discussion and conclusion.

This study aimed at determining the impact of fertility and health status on female labour force participation. Econometric analyses were based on a sample of urban workers aged 18 to 64 years old. In contrast to previous models in the literature, the study aimed to demonstrate the interrelationship between fertility and health status, and argued that failing to account for this interrelationship may lead to biased estimates of either the impact of health or fertility on female labour force participation. In this process, analyses show that it is not relevant to consider a single labour market as in the traditional neoclassical labour market; individual behaviours and labour force determinants differ across the various sectors.

The fact that the number of children exerts a positive influence on the participation contrasts with the results of other studies, which consider fertility as an exogenous variable. But this result is consistent with those of Cain and Dooley (1976), Hout (1978), and Iacovou (2001). The non-significant impact of fertility in the informal sector is close to the conclusions made by Hill and Stafford (1985).

The differential impacts on the participation of the self-reported health and the disability status were questioned. Therefore relative risk ratios were computed for fertility, self-reported health and disability status, and estimates reported in table 11. As a means of comparison between the two indicators, results show that the use of self-reported health leads to an upper-bias of the impact of health status on labour market participation.

Another result of this paper is the evidence that fertility determines health status and vice versa. These results suggest that estimates of either the impact of fertility or the influence of health status on women labour force participation must take into consideration the interrelationship between health and fertility.

Throughout this paper, we considered only 2SLS estimates of our multiple simultaneous equations model. However, one could argue that these equations could have been estimated jointly. Attempts in this direction have not been successful, as handling a trivariate model is technically and computationally difficult. We hope this attempt contributes to defining the steps of this line of inquiry.

References

- Abessolo, Y. (2001). Segmentation du marché du travail urbain et pauvreté dans les pays en développement: le cas du Cameroun. *Revue Africaine des Sciences Economiques et de Gestion*, 3(1), 81–111
- Adair, L.S. & Popkin, B.M. (1992). Prolonged lactation contributes to depletion of energy reserves of Filipino women. *Journal of Nutrition*, 122, 1643–1655
- Adcock, C.J. (1997). Sample Size Determination: A Review. *The Statistician*, 46(2), Special Issue: Sample Size Determination, 261–283
- Ainsworth, M. (1988). *Socioeconomic Determinants of Fertility in Cote d'Ivoire*. New Haven, Connecticut: Economic Growth Center, Yale University
- Angrist, J.D. & Evans, W.N. (1998). Children and their parents' labour supply: Evidence from exogenous variation in family size. *The American Economic Review*, 88(3), 450–477
- Bartel, A. & Taubman, P. (1979). Health and labour market success the role of various diseases. *Review of Economics and Statistics*, 61(1), 1–8
- Benjamin, D. (1992). Household composition, labour markets, and labour demand: Testing for separation in agricultural households model. *Econometrica*, 60, 287–322
- Bonin, H. & Euwals, R. (2002). Participation behaviour of East German women after German unification. CEPR Discussion Paper No 3201. London.
- Bound, J. (1991). Self-reported versus objective measures of health in retirement models. *Journal of Human Resources*, 26(1), 106–138
- Bound, J., Schoenbaum, M. Stinebrickner, T.R. & Waidmann, T. (1996). Race differences in labor force attachment and disability status. *Gerontologist*, 36, 311–321
- Brewster, K.L. & Rindfuss, R.R. (2000). Fertility and women's employment in industrialized nations. *Annual Review of Sociology*, 26, 271–296
- Cai, L. & Kalb, G. (2004). Health status and labour force participation: Evidence from the HILDA Data. Melbourne Institute of Applied Economic and Social Research Working Paper No. 4. Melbourne, Australia.
- Cain, G.G. & Dooley, M. (1976). Estimation of a model of labour supply, fertility and wages of married women. *Journal of Political Economy*, 84(4), S179–S199.
- Cain, G.G. (1966). *Labor force participation of married women*. Chicago: University of Chicago Press.
- Chase, R. (1995). Women's labour force participation during and after communism: A case study. Economic Growth Center Working Paper No. 768. New Haven: Yale University.
- Chirikos, T.N. (1993). The relationship between health and labor market status. *Annual Reviews of Public Health*, 14, 293–312.
- Cramer, J.C. (1980). Fertility and female employment: Problems of causal direction. *American Sociological Review*, 45(2), 167–190.
- Curie J. & Madrian, B.C. (1999). Health, health insurance and the labour market. In O. Ashenfelter & D. Card (Eds). *Handbook of Labor Economics*. Amsterdam: North Holland. (Volume 3).
- Dumont, J.C. (1999). Santé, éducation et développement : une approche systémique de l'hétérogénéité du capital humain. Analyses théoriques et applications au cas de Madagascar. Thèse de Doctorat. Université Paris IX Dauphine.
- Ekerdt, D.J., Baden, L., Bosse, R. & Dibbs, E. (1983). The effect of retirement on physical health. *American Journal of Public Health*, 73, 779–783.
- Ellingsæter, A.L. & Ronsén, M. (1996). The dual strategy: motherhood and the work contract in Scandinavia. *European Journal of Population*, 12, 239–260.
- Fong, M. & Lokshin, M. (2000). Child care and women's labor force participation in Romania. World Bank Working Paper No 2400. The World Bank, Washington, D.C.

- Griliches, Z. & Intriligator, M.D. (1986). *Handbook of Econometrics*. Elsevier Science Publishers.
- Gurmu, S. & Trivedi, P.K. (1996). Excess zeros in count models for recreation trips. *Journal of Business and Economic Statistics*, 14, 469–477.
- Hausman, J.A. (1980). The effect of wages, taxes and fixed costs on women's labour force participation. *Journal of Public Economics*, 14, 161–194.
- Haveman, R.H., Wolfe, B.L. & Warlick, J.L. (1988). Labour market behaviour of old men: Estimates from a trichotomous choice model. *Journal of Public Economics*, 36, 153–175.
- Hill, C.R. & Stafford, F.P. (1985). Lifetime fertility, child care, and labour supply. In F.T. Juster & F.P. Stafford (Eds). *Time, Goods, and Well-being*, University of Michigan.
- Hill, M.A. (1983). Female labour force participation in developing and developed countries: Consideration of the informal sector. *The Review of Economics and Statistics*, 65(3), 459–468.
- Hill, M.A. (1994). Female labour supply in Japan. Implications of the informal sector for labour force participation and hours of work. *Journal of Human Resources*, 24(1), 143–161.
- Hout, M. (1978). The determinants of marital fertility in the United states, 1968–70: Inference from a dynamic model. *Demography*, 15(2), 132–159.
- Iacovou, M. (2001). Fertility and female labour supply. Institute of Social and Economic Research Working Paper No. 19. University of Essex, Colchester.
- INS/DSCN. (2001). *Deuxième enquête camerounaise auprès des ménages (ECAM-II) : Premiers résultats*. Institut National de la Statistique. Yaoundé, Cameroun.
- Jejeebhoy, S.J. & Rao, S.R. (1995). Unsafe motherhood: A review of reproductive health. In M. Das Gupta, L.C. Chen & T.N. Krishnan (Eds). *Women's health in India: Risk and vulnerability*. Bombay, Oxford University Press.
- Johnson-Hanks, J. (2002). The lesser shame: abortion among educated women in southern Cameroon. *Social Science and Medicine*, 55(8), 1337–1349.
- Lanot, G. & Muller, C. (1997). Dualistic sector choice and female labour supply: evidence from formal and informal sectors in Cameroon. Centre for the Study of African Economies Working Paper Series No. 9. Oxford, United Kingdom.
- Lavy, V., Palumbo, M. & Stern, S. (1995). Health care in Jamaica: Quality, outcomes, and labour supply. LSMS Working Paper No. 116.
- Lelièvre, E. & Gauthier, A.H. (1994). L'emploi des femmes en Europe : inégalités, discontinuité, politiques sociales. In Mission recherche du ministère des Affaires sociales, de la Santé et de la Ville. *Rencontres et Recherches, comparer les systèmes de Protection Sociale en Europe*. Rencontres d'Oxford, 1 : 493–518.
- Leung, S.F. & Wong, C.T. (2002). Health status and labor supply: Interrelationship and determinants. Mimeo. Hong Kong University of Science and Technology.
- Locoh, T. (1988). Structure familiales et changements sociaux. In D. Tabutin (Ed.), *Population et sociétés en Afrique au Sud du Sahara*. Paris: l'Harmattan.
- Marmot, M.G., Smith, G.D., Stansfeld, S., Patel, C. & North, F. (1991). Health inequalities among British civil servants: The Whitehall II study. *Lancet*, 337(6), 1387–1393.
- Merchant, K. & Martorell, R. (1991). Frequent reproductive cycling: Does it lead to nutritional depletion of mothers?. *Progress in Food and Nutrition Science*, 12, 339–369.
- Miller, J.E., Rodriguez, G. & Pebley, A.R. (1994). Lactation, seasonality, and mother's postpartum weight change in Bangladesh: An analysis of maternal depletion. *American Journal of Human Biology*, 6(4), 511–524.
- Mincer, J. (1962). Labor force participation of married women: A study of labor supply. In H.G. Lewis (Ed.), *Aspects of Labor Economics*. Princeton, New Jersey: National Bureau of Economic Research, Princeton University Press.
- Mroz, T.A. (1987). The sensitivity of an empirical model of married women's hours of work to economic and statistical assumptions. *Econometrica*, 55(4), 765–799.
- Parsons, D. (1980). The decline in male labor force participation. *Journal of Political Economy*, 88, 117–134.

- Ranis, G. (1988). Analytics of development: Dualism. In H. Chenery and T.N. Srinivasan, (Eds.), *Handbook of Development Economics*. Elsevier (Volume 1).
- Rindfuss, R.R., Cooksey, E.C. & Sutterlin, R.L. (1999). Young adult occupational achievement: Early expectations versus behavioural reality. *Work and Occupation*, 26, 220–263.
- Rosenfeld, R.A. (1996). Women's work histories. *Population Development Review*, 22, S199–S222.
- Ross, C.E. & Mirowsky, J. (1995). Does employment affect health?. *Journal of Health and Social Behavior*, 36(3), 230–243.
- Rwenge, M. (1999). Changement social, structures familiales et fécondité en Afrique subsaharienne: Le cas du Cameroun. *Les Cahiers de l'IFORD*, n°26, Yaoundé.
- Saget, C. (1999). The determinants of female labour supply in Hungary. *Economics of Transition*, 7(3), 575–591.
- Scheffler, R. & Iden, G. (1974). The effect of disability on labor supply. *Industrial Labor Relations Review*, 28, 122–132.
- Sickles, R.C. & Taubman, P. (1986). An analysis of the health and retirement status of the elderly. *Econometrica*, 54, 1339–1356.
- Stern, S. (1989). Measuring the effect of disability on labour force participation. *The Journal of Human Resources*, 24(3), 361–395.
- Tausman, P. & Rosen, S. (1982). Healthiness, education and marital status. In V. Fuchs, (Ed.). *Economic Aspects of Health*. Chicago: University of Chicago Press.
- Tessier, P. & Wolf, F.C. (2005). Offre de travail et santé en France. *Economie et Prévisions*, 168(2), 1–40.
- Velkoff, V.A. & Adlakha, A. (1998). Women of the world, women's health in India. *The Official Statistics*, 3, 1–11.
- Weller, R.H. (1977). Wife's employment and cumulative size in the United States, 1970 and 1960. *Demography*, 14(1), 43–65.
- WHO. (1995). *The use and interpretation of anthropometry*. Geneva: World Health Organization.
- Winkelmann, R. (1997). *Econometric analysis of count data*. 2nd Edition. Berlin Heidelberg, New York: Springer Verlag.

Notes

Note 1. Chirikos (1993) and Curie and Madrian (1999) review the literature on this issue.

Note 2. In 2004, the fertility rate was 5.0 in Cameroon, the highest (6.1) being observed in rural areas (INS/DNSC, 2004). About 45% of women suffer from anaemia; those who have a child are almost 49%, the highest rates being observed in urban areas (54% in Yaoundé, 44% in Douala, and 42 % in rural areas). Female nutritional status (measured by the Body Mass Index), an important determinant of female mortality (WHO, 1995), is also a concern in Cameroon: 7% of women have a BMI less than 18.5 and 29% are over 25, the highest BMI being observed in Yaoundé and Douala (25.5). These results in high maternal mortality rates: between 1998 and 2004, the rate was evaluated at 669 female deaths for 100,000; this rate is far higher than that observed in developed countries.

Note 3. According to the sampling theory, when computing the probability p , the acceptable error is minimum when the population variance is set equal to $p(1-p)/n$ and the studied phenomenon approximated to a normal distribution. Then using the Moivre-Laplace theorem, the sample size is determined using the formula, where represents the p -value of the normal distribution $N(0; 1)$. See also Adcock (1997) for further details on sample size determination.

Note 4. Lack of comparability across individuals represents measurement error that is likely to lead to underestimates of the impact of health on labour force participation, while the endogeneity of self-reported health is likely to lead to overestimates. Biased estimates of health's impact on outcomes will also bias coefficients on any variable correlated with health. Finally, the dependence of self-reported health on economic characteristics will bias estimates of the impact of economic variables on participation, even if one correctly measures the impact of health itself.

Note 5. The Sub-Health was recoded as follows: Very-good = 0, Good = 1, Fair = 3 and Bad = 4. Then health limitations were coded: No = 0 and Yes = 1.

Note 6. p = public sector; fp = formal private sector; inf = informal sector; np = non-participation.

Note 7. The sample mean 1.762882 is statistically equal to 2 as the t-ratio is equal to (0.237/0.925) and $\Pr(|T| > |t|) = 0.0000$.

Note 8. In the study by Sickles and Taubman (1986) of the relationship between health and labour force participation, the mean age is 63.3 years.

Note 9. where, represents the value of likelihood function, is the number of parameters and refers to the number of observations. For both specifications, CAIC is equal to 6870.167 and 6869.48.

Table 1. Characteristics of the final sample of women surveyed.

	Yaoundé	Douala	Total
Number of observations	1022	1074	2096
Not working	430	473	903
Public sector	159	95	254
Formal private sector	154	230	384
Informal sector	279	276	555

Source: From the survey.

Table 2. Prevalence of potential disability in the sample

	Values	Not employed ^{\$}	Employed ^{\$}
Composite Index of Disability (CID)	0	14,6	14,4
	1	22,8	23,5
	2	21,3	25,7
	3	17,8	19,6
	4	13,0	10,1
	5	5,3	4,6
	6	3,4	2,0
	7	4,0	0,1
Total		100	100

(^{\$}) Values represent percentages of women concerned with each level of disability.

Source: Author's construction.

Table 3. Description of variables

Variables	Description
Participation	1 = if employed in the public sector ; 2 = formal private sector ; 3 = informal sector ; 0 = not employed.
Fertility	Fertility refers to the parity, that is, the number of children born to a woman at the date of the survey.
Child-non-charge	Number of children whose charges are not supported by the woman nor her husband.
Deaths	Number of own child born alive who died.
Relatives	Number of relatives (other children and adults) living in the same house with the woman.
Health status	
Sub-health	Self-rated health: 0 = bad; 1 = fair; 2 = good; 3 = very-good.
Problems (14 days)	1 if the respondent has any health-related problem in the last 14 days before the survey, 0 otherwise.
Long-term disease	1 if the respondent has any disease which has lasted more than one month.
Health limitations	
Mobility/standing	Each of these variables is dummy coded 1 if the woman reports a health problem related to it and 0 otherwise.
Watching/hearing	
Disabled	1 if the composite index of disability, CID $\geq$ 4 and 0 otherwise.
Education	Highest level of education (for those who completed schooling). Education was classified in four levels: 0 = no education; 1 = primary; 2 = secondary; 3 = tertiary (university and other related categories of higher education).
Age	Continuous variable ranges from 18 to 64.
Age ² /100	Age squared divided by 100.
Single	1 if the respondent is single, separated, divorced or widowed; 0 if the respondent cohabitates or is married.
Religion	1 if Catholic; 2 = Protestant; 3 = Muslims, 4 = Otherwise. These categories were transformed into specific dummies.
Province	Cameroon has 10 provinces out of which, we defined 5 groups according to social habits and customs. We have: 1 = North grouping the Far-North, North, and Adamaoua provinces; 2 = Central province; 3 = South is composed of South and East provinces; 4 = West comprised the West, North-West and South-West provinces; 5 = Littoral province.

Table 4. Descriptive statistics of variables (N = 2,096)

Variables	Mean	Standard Deviation	Min	Max
Participation	1.281966	1.262713	0	3
Fertility	2.594943	2.384027	0	14
Child-non-charge	0.3330153	1.097525	0	14
Deaths	0.2977099	0.7932378	0	14
Relatives	3.029103	2.595317	0	10
Health status				
Sub-health	1.762882	0.9256752	0	3
Problems (14 days)	0.365458	0.4816733	0	1
Long-term disease	0.2437977	0.4294745	0	1
Health Limitations				
Mobility	0.1665076	0.3726246	0	1
Standing	0.2676527	0.4428411	0	1
Watching	0.4446565	0.4970462	0	1
Hearing	0.1292939	0.335605	0	1
Disabled	0.197042	0.3978592	0	1
Education	3.9375	1.899731	0	7
Primary	0.1397901	0.3468519	0	1
Secondary	0.6402672	0.4800365	0	1
Tertiary	0.158874	0.3656458	0	1
Age	33.03865	10.02098	18	64
Single	0.4255725	0.4945475	0	1
Religion	1.918416	1.45071	0	7
Catholic	0.5267176	0.4994048	0	1
Protestant	0.3024809	0.459442	0	1
Muslim	0.057729	0.2332859	0	1
Province	5.33063	2.807922	0	10
North	0.0500954	0.2181939	0	1
Centre	0.3010496	0.4588237	0	1
South	0.1402672	0.3473469	0	1
West	0.3401718	0.4738798	0	1
Littoral	0.1669847	0.3730512	0	1

Table 5. Second stages maximum likelihood estimates of fertility equation

Variables	Coefficients (t-student)	
	(1)	(2)
Age	0,172 (11,36)***	0,173 (11,35)***
Age ² /100	-0,182 (-9,71)***	-0,184 (-9,80)***
Single	-0,242 (-7,45)***	-0,236 (-7,02)***
Education		
Primary	0,053 (0,97)	0,052 (0,91)
Secondary	-0,081 (-1,22)	-0,092 (-1,40)
Tertiary	-0,499 (-4,99)***	-0,841 (-4,97)***
Child-non-charge	0,098 (7,01)***	0,099 (7,17)***
Deaths	0,219 (10,43)***	0,219 (10,30)***
Relatives	0,102 (16,76)***	0,102 (17,06)***
Health status (predicted)		
Sub-Health	0,046 (1,88)*	
Disabled		-0,153 (-1,38)
Participation status (predicted)		
Public	-0,468 (-2,12)**	-0,558 (-2,30)**
Formal private	-0,466 (-1,78)*	-0,403 (-1,37)***
Informal	-0,750 (-3,75)***	-0,868 (-4,01)***
Constant	-2,589 (-10,03)***	-2,576 (-10,02)***
Lalpha	-16,915 (0,120)	-17,113 (0,117)
alpha	4,50e-08 (5,41e-09)	3,70e-08 (4,34e-09)
Observations =	2064	2064
Wald (13) =	2688,90	2685,49
Prob > chi2 =	0,0000	0,0000
Log pseudolikelihood	-3374,9731	-3374,3135

Dependent variable: **Fertility**; (1) is estimated using *Sub-Health* as the health indicator; (2) is estimated using *Disabled* as the health indicator. Variables *No-education*, *Other religions*, *Not-employed*, are base outcomes for education, religion, participation status. Values within parentheses under estimators represent *t*-Student. ***(**){*} significant at 0.000(0.005) {0.01}.

Table 6. Second stages maximum likelihood estimates of health equations

Variables	Coefficients (t-student)	
	<i>Sub-health</i>	<i>Disabled</i>
Age	0,053 (1,80)*	0,127 (2,08)***
Age ² /100	-0,080 (-2,29)**	-0,105 (-2,02)**
Education		
<i>Primary</i>	0,115 (0,94)	-0,175 (-1,04)
<i>Secondary</i>	0,175 (1,33)	-0,023 (-0,13)
<i>Tertiary</i>	0,121 (0,65)	-0,379 (-1,51)
Fertility (predicted)	-0,188 (-2,64)**	0,005 (0,04)
Participation status (predicted)		
<i>Public</i>	0,304 (0,79)	-4,097 (-6,40)***
<i>Formal Private</i>	-1,294 (-2,55)**	-0,970 (-1,34)
<i>Informal</i>	0,034 (0,09)	-3,274 (-6,43)***
Health limitations		
<i>Mobility</i>	-0,336 (-4,56)***	
<i>Watching</i>	-0,096 (-1,82)*	
<i>Hearing</i>	-0,217 (-2,70)**	
Problems (14 days)	-0,905 (-15,37)**	0,649 (8,37)***
Long-term disease	-0,799 (-10,98)***	0,705 (8,25)***
Ancillary parameters		
μ_1	-1,837	
μ_2	(0,495)	
μ_3	-0,246 (0,493)	
Constant	0,811 (0,493)	-2,781 (-3,83)**
Observations =	2096	2096
Wald chi2 (14) [(11)] =	690,35	428,77
Prob > chi2 =	0,0000	0,0000
Pseudo R2 =	0,1437	0,12462
Log likelihood =	-2295,744	-784,0628

Dependent variable: **Health Status**; Variables *No-education*, *Not-employed*, are base outcomes for education, participation status. Values within parentheses under estimators represent *t*-Student. ***(**){*} significant at 0.000(0.005) {0.01}.

Table 6. (continued): Marginal effects

Variables	Sub-Health			Disabled
	Fair	Good	Very-good	
Age	-0,016 (-1,79)*	0,006 (1,77)*	0,015 (1,79)*	0,029 (2,90)***
Age ² /100	0,025 (2,29)**	-0,008 (-2,25)**	-0,022 (-2,29)**	-0,024 (-2,03)**
Education				
Primary	-0,036 (-0,94)	0,011 (1,09)	0,033 (0,91)	-0,037 (-1,12)
Secondary	-0,054 (-1,34)	0,020 (1,25)	0,048 (1,36)	-0,005 (-0,13)
Tertiary	-0,037 (-0,64)	0,011 (0,76)	0,035 (0,63)	-0,075 (-1,76)
Fertility	0,058 (2,63)***	-0,020 (-2,60)***	-0,053 (-2,62)***	0,001 (0,04)
Participation status				
Public	-0,095 (-0,79)	0,033 (0,79)	0,085 (0,79)	-0,941 (-6,49)***
Formal Private	0,404 (2,53)**	-0,140 (-2,49)**	-0,363 (-2,54)**	-0,222 (-1,34)
Informal	-0,011 (-0,09)	0,004 (0,09)	0,009 (0,09)	-0,752 (-6,43)***
Health limitations				
Walking	0,101 (4,80)***	-0,047 (-3,68)***	-0,085 (-5,07)***	
Seeing	0,030 (1,82)**	-0,011 (-1,78)*	-0,027 (-1,83)*	
Understanding	0,066 (2,77)**	-0,028 (-2,26)**	-0,057 (-2,92)***	
Problem (14 days)	0,255 (14,82)***	-0,120 (-10,23)***	-0,227 (-16,36)***	0,163 (7,98)***
Long-term disease	0,219 (12,32)***	-0,125 (-7,84)***	-0,185 (-13,63)***	0,192 (7,24)***
Health Probability ^s	0,377	0,386	0,201	0,146

Dependent variable: **Health Status**; Variables *No-education*, *Not-employed*, are base outcomes for education, participation status. Values within parentheses under estimators represent *t*-Student. ***(**){*} significant at 0.000(0.005) {0.01}.

Table 7. Second stages maximum likelihood estimates of participation equations

Variables	Public sector		Formal private sector		Informal sector	
	(1)	(2)	(1)	(2)	(1)	(2)
Age	0,442 (5,52)***	0,429 (5,27)***	0,287 (4,37)***	0,270 (4,40)***	0,129 (2,50)**	0,123 (2,39)***
Age ² /100	-0,470 (-4,77)***	-0,447 (-4,42)***	-0,365 (-4,50)***	-0,334 (-4,02)***	-0,194 (-3,10)***	-0,180 (-2,84)
Single	0,389 (2,04)**	0,406 (2,10)**	0,541 (3,36)***	0,572 (3,51)***	0,563 (3,94)***	0,571 (4,00)***
Education						
Primary	-0,450 (-0,86)	-0,569 (-1,08)	,193 (0,48)	0,061 (0,15)	0,202 (0,78)	0,144 (0,55)
Secondary	1,345 (3,10)***	1,212 (2,77)***	0,961 (2,61)***	0,815 (2,20)**	-0,050 (0,21)	-0,017 (-0,07)
Tertiary	2,065 (4,28)***	1,936 (3,98)***	0,805 (1,97)**	0,673 (1,64)	-1,760 (-4,98)***	-0,182 (-5,13)***
Fertility	0,558 (2,15)**	0,491 (1,88)*	0,325 (1,39)	0,307 (1,25)	0,536 (2,57)***	0,507 (2,47)**
Health status						
Sub-Health	0,476 (3,72)***		0,414 (4,14)***		0,195 (2,37)**	
Disability		-1,774 (-3,30)***		-1,903 (-4,20)***		-0,884 (-2,46)**
Religion						
Muslim	-1,055 (-,92)*	-0,826 (-1,52)	-0,700 (-1,65)*	-0,511 (-1,22)	-0,245 (-0,73)	-0,156 (-0,47)
Catholic	-0,332 (-1,29)	-0,328 (-1,28)	-0,212 (-0,99)	-0,228 (-1,07)	-0,058 (-0,31)	-0,066 (-0,35)
Protestant	-0,416 (-1,53)	-0,432 (-1,58)	-0,083 (-0,37)	-0,136 (-0,59)	-0,274 (-1,35)	-0,299 (-1,47)
Province						
North	-0,322 (-0,68)	-0,349 (-0,73)	-1,67 (-3,52)***	-1,712 (-3,60)***	-1,499 (-3,70)***	-1,506 (-3,72)***
Centre	-0,306 (-1,34)	-0,219 (-0,96)	-0,573 (-3,01)***	-0,485 (-2,56)**	-0,091 (-0,51)	-0,044 (-0,25)
South	0,326 (1,33)	0,379 (1,52)	-0,544 (-2,38)**	-0,498 (-2,19)**	-0,108 (-0,50)	-0,084 (-0,39)
West	-0,376 (-1,61)	-0,330 (-1,42)	-0,136 (-0,75)	-0,086 (-0,48)	0,317 (1,82)*	0,345 (1,98)**
Constant	-11,722 (-8,03)***	-11,66 (-7,62)***	-6,518 (-5,66)***	-6,062 (-5,14)***	-2,731 (-2,93)***	-2,566 (-2,72)***
(1): Observations= 2096/ Wald Chi2(45)= 452,96/ Prob >Chi2= 0,0000/ Pseudo R2= 0,1085/ Log Pseudolikelihood= -2394,1194						
(2): Observations= 2096/ Wald Chi2(45)= 451,72/ Prob >Chi2= 0,0000/ Pseudo R2= 0,1082/ Log Pseudolikelihood= -2395,0825						

Dependent variable: **Participation**; (1) is estimated using *Sub-Health* as the health indicator; (2) is estimated using *Disabled* as the health indicator. Variables *Married*, *No-education*, *Other religions*, *Littoral*, are base outcomes for marital status, education, religion, and province. Values within parentheses under estimators represent *t*-Student. ***(**){*} significant at 0.000(0.005) {0.01}.

Table 7. (continued): Marginal effects

<i>Variables</i>	<i>Public sector</i>		<i>Formal private sector</i>		<i>Informal sector</i>	
	(1)	(2)	(1)	(2)	(1)	(2)
<i>Age</i>	0,024 (4,73)***	0,024 (4,55)***	0,031 (3,36)***	0,291 (3,06)***	0,002 (0,21)	0,002 (0,20)
<i>Age²/100</i>	-0,024 (-3,74)***	-0,023 (-3,52)***	-0,039 (-3,43)***	-0,035 (-3,02)***	-0,009 (-0,89)	-0,009 (-0,81)
<i>Single</i>	0,008 (0,65)	0,008 (0,68)	0,049 (2,13)**	0,053 (2,27)**	0,073 (2,87)***	0,073 (2,84)***
Education						
<i>Primary</i>	-0,033 (-1,28)	-0,037 (-1,49)	0,025 (0,41)	0,008 (0,15)	0,037 (0,74)	0,035 (0,69)
<i>Secondary</i>	0,072 (2,89)***	0,067 (2,65)***	0,117 (2,53)**	0,102 (2,15)**	-0,058 (-1,31)	-0,063 (-1,39)
<i>Tertiary</i>	0,270 (2,98)***	0,258 (2,89)***	0,117 (1,48)	0,103 (1,33)	-0,285 (-12,12)***	-0,286 (-12,02)***
Fertility	0,024 (1,47)	0,020 (1,22)	0,017 (0,51)	0,151 (0,44)	0,075 (2,09)**	0,072 (2,02)**
Health status						
<i>Sub-Health</i>	0,024 (2,76)***		0,047 (3,31)***		0,007 (0,53)	
<i>Disability</i>		-0,081 (-2,22)**		-0,222 (-3,46)***		-0,041 (-0,64)
Religion						
<i>Muslim</i>	-0,045 (-2,33)**	-0,038 (-1,74)*	-0,072 (-1,66)*	-0,055 (-1,16)	-0,004 (-0,06)	0,004 (0,08)
<i>Catholic</i>	-0,019 (-1,10)	-0,018 (1,07)	-0,025 (-0,89)	-0,027 (-0,90)	0,006 (0,18)	0,005 (0,16)
<i>Protestant</i>	-0,217 (-1,33)	-0,022 (-1,31)	0,006 (0,19)	-0,007 (-0,02)	-0,039 (-1,17)	-0,042 (-1,22)
Province						
<i>North</i>	0,014 (0,38)	0,012 (0,33)	-0,137 (-4,82)***	-0,139 (-5,00)***	-0,170 (-4,63)	-0,170 (-4,64)***
<i>Centre</i>	-0,012 (-0,83)	-0,007 (-0,54)	-0,074 (-3,16)***	-0,065 (-2,75)***	0,140 (0,45)	0,018 (0,56)
<i>South</i>	0,036 (1,71)*	0,041 (1,85)*	-0,074 (-3,01)***	-0,069 (-2,82)**	-0,005 (-0,14)	-0,004 (0,11)
<i>West</i>	-0,029 (-2,13)	-0,027 (-2,00)**	-0,031 (-1,29)	-0,026 (-1,67)	0,076 (2,38)**	0,079 (2,45)**
Probabilities	0,076	0,077	0,189	0,189	0,258	0,258

Dependent variable: **Participation**; (1) is estimated using *Sub-Health* as the health indicator; (2) is estimated using *Disabled* as the health indicator. Variables *Married*, *No-education*, *Other religions*, *Littoral*, are base outcomes for marital status, education, religion, and province. Values within parentheses under estimators represent *t*-Student. ***(**){*} significant at 0.000(0.005) {0.01}.

Table 8. First stage maximum likelihood estimates of fertility equation

Variables	Coefficients (t-student)	
	(1)	(2)
Age	0,139(12,67)***	0,139(12,72)***
Age ² /100	-0,141(-9,70)***	-0,142(-9,81)***
Single	-0,289(-9,89)***	-0,291(-9,93)***
Education		
Primary	0,052(0,92)	0,045(0,81)
Secondary	-0,078(-1,50)	-0,083(-1,61)
Tertiary	-0,389(-6,32)***	-0,395(-6,06)***
Child-non-charge	0,089(6,32)***	0,088(6,33)***
Deaths	0,216(10,18)***	0,218(10,28)***
Relatives	0,092(16,24)***	0,092(16,30)***
Religion		
Muslim	0,101(1,34)	0,105(1,38)
Catholic	-0,102 (-0,27)	-0,007(-0,17)
Protestant	0,036(0,77)	0,039(0,83)
Health limitations		
Walking	0,028(0,84)	
Seeing	-0,020(-0,76)	
Understanding	-0,037(-0,94)	
Problem (14 days)	-0,0008(-0,03)	-0,001(-0,58)
Long-term disease	-0,017(-0,53)	-0,018(-0,58)
Province		
North	0,226(3,10)***	0,217(2,93)***
Centre	0,050(1,30)	0,049(1,28)
South	0,009(0,21)	0,012(0,27)
West	0,005(0,14)	0,004(0,13)
Constant	-2,364(-11,11)***	2,379(-11,21)***
lnalpha	-18,524 (0,213)	-16,880 (0,185)
alpha	9,01e-09 (1,92e-09)	4,64e-08 (8,62e-09)
Observations =	2064	2064
Wald chi2 (21)[(18)]=	2685,66	2679,27
Prob > chi2 =	0,0000	0,0000
Log pseudolikelihood =	-3369,632	-3370,481

Dependent variable: **Fertility**; (1) is estimated using *Sub-Health* as the health indicator; (2) is estimated using *Disabled* as the health indicator. Variables, *Married*, *No-education*, *Other religions*, *Littoral*, are base outcomes for marital status, education, religion, and province. Values within parentheses next to the estimators are *t*-Student. ***(**){*} significant at 0.000(0.005) {0.01}.

Table 9. First stage maximum likelihood estimates of health equations

Variables	Coefficients (t-student)	
	<i>Sub-health</i>	<i>Disabled</i>
Age	0,00015 (0,01)	-0,021(-0,86)
Age ² /100	-0,015(-0,64)	0,058(1,80)*
Single	0,0221(0,43)	0,062(0,84)
Education		
Primary	0,116(0,96)	-0,336(-2,12)**
Secondary	0,128(1,18)	-0,346(-2,41)**
Tertiary	0,143(1,16)	-0,312(-1,87)*
Child-non-charge	-0,029(-1,18)	0,034(1,04)
Deaths	-0,048(-1,53)	0,077(1,85)*
Relatives	-0,017(-1,55)	-0,012(-0,82)
Religion		
Muslim	0,383(2,61)***	0,097(0,49)
Catholic	0,128(1,60)	-0,169(-1,54)
Protestant	0,180(2,12)**	-0,33(-2,78)***
Health Limitations		
Walking	-0,319(-4,37)***	
Seeing	-0,106(-2,06)**	
Understanding	-0,229(-2,87)***	
Problem (14 days)	-0,861(-15,51)***	0,698(9,59)***
Long-term disease	-0,761(-12,04)***	0,809(10,56)***
Province		
North	0,076(0,50)	-0,222(-0,99)
Centre	0,117(1,57)	0,083(0,76)
South	0,178(2,02)	-0,104(-0,78)
West	0,085(1,16)	0,038(0,36)
Ancillary Parameters		
μ_1	-2,33	
μ_2		
μ_3	-0,737	
Constant	0,323	-1,008(-2,19)**
Observations =	2096	2096
LR chi2(21) / (18) =	799,42	459,21
Prob > chi2 =	0,0000	0,0000
Log likelihood =	-2291,96	-810,58
Pseudo R2 =	0,1485	0,2207

Dependent variable: **Health Status**; Variables, *Married*, *No-education*, *Other religions*, *Littoral*, are base outcomes for marital status, education, religion, and province. Values within parentheses next to the estimators are *t* -Student. ***(**){*} significant at 0.000(0.005) {0.01}.

Table 10. First stage maximum likelihood estimates of participation equations

Variables	Specification (1)		
	Public sector	Formal private sector	Informal sector
Age	0,486(6,83)***	0,327(6,28)***	0,197(4,86)***
Age ² /100	-0,508(-5,41)***	-0,411(-5,72)***	-0,263(-4,74)***
Single	0,346(2,01)**	0,483(3,54)***	0,438(3,62)***
Education			
Primary	-0,445(-0,85)	0,222(0,55)	0,230(0,91)
Secondary	1,190(2,72)***	0,945(2,57)***	0,021(0,09)
Tertiary	1,71(3,72)***	0,681(1,74)*	-1,94(-5,71)
Child-non-charge	-0,155(-1,42)	-0,0047(-0,06)	0,078(1,44)
Deaths	-0,053(-0,53)	-0,018(-0,21)	0,0078(0,11)
Relatives	0,095(2,92)***	0,048(1,68)*	0,064(2,49)**
Religion			
Muslim	-0,762(-1,46)	-0,494(-1,14)	-0,134(-0,40)
Catholic	-0,298(-1,17)	-0,169(-0,80)	-0,059(-0,32)
Protestant	-0,309(-1,15)	0,0041(0,02)	-0,241(-1,22)
Health Limitations			
Walking	-0,202(-0,86)	-0,174(-0,87)	-0,069(-0,42)
Seeing	-0,158(-0,95)	-0,0047(-0,04)	-0,239(-1,96)**
Understanding	-0,271(-0,97)	-0,068(-0,32)	-0,172(-0,93)
Problem (14 days)	-0,243(-1,39)	-0,317(-2,20)**	-0,118(-0,94)
Long-term disease	-0,486(-2,39)**	-0,376(-2,18)**	-0,083(-0,59)
Province			
North	-0,227(-0,50)	-1,59(-3,18)***	-1,37(-3,44)***
Centre	-0,235(-1,01)	-0,516(-2,74)***	-0,047(-0,26)
South	0,427(1,71)*	-0,464(-2,04)**	-0,080(-0,37)
West	-0,374(-1,55)	-0,116(-0,65)	0,317(1,82)*
Constant	-12,41(-9,15)***	-7,21(-7,54)***	-3,85(-5,12)****
Observations =	2096		
LR chi2(51) =	603,08		
Prob > chi2 =	0,0000		
Log likelihood =	-2384,0972		
Pseudo R2 =	0,1123		

Dependent variable: **Participation Status**; (1) is estimated using *Sub-Health* as the health indicator; Variables, *Married*, *No-education*, *Other religions*, *Littoral*, are base outcomes for marital status, education, religion, and province. Values within parentheses next to the estimators are *t*-Student. ***(**){*} significant at 0.000(0.005){0.01}.

Table 10. (continues): First stage maximum likelihood estimates of participation equations

Variables	Specification (2)		
	Public sector	Public sector	Public sector
Age	0,488(7,18)***	0,326(6,28)***	0,204(5,03)***
Age ² /100	-0,52(-5,93)***	-0,411(-5,75)***	-0,277(-5,00)***
Single	0,329(1,97)**	0,476(3,49)***	0,419(3,48)***
Education			
Primary	-0,434(-0,83)	0,238(0,59)	0,234(0,93)
Secondary	1,21(2,77)***	0,956(2,62)***	0,018(0,08)
Tertiary	1,73(3,74)***	0,703(1,80)*	-1,95(-5,77)***
Child-non-charge	-0,154(-1,59)	-0,0049(-0,07)	0,081(1,49)
Deaths	-0,047(-0,46)	-0,019(-0,22)	0,012(0,17)
Relatives	0,097(2,97)***	0,049(1,68)*	0,066(2,58)***
Religion			
Muslim	-0,754(-1,45)	-0,498(-1,16)	-0,111(-0,33)
Catholic	-0,268(-1,05)	-0,156(-0,74)	-0,033(-0,18)
Protestant	-0,268(-1,00)	0,018(0,08)	-0,216(-1,10)
Health Limitations			
Walking			
Seeing			
Understanding			
Problem (14 days)	-0,294(-1,70)*	-0,344(-2,41)**	-0,163(-1,32)
Long-term disease	-0,55(-2,66)***	-0,408(-2,43)**	-0,140(-1,02)
Province			
North	-0,218(-0,48)	-1,57(-3,15)***	-1,37(-3,46)***
Centre	-0,247(-1,07)	-0,513(-2,73)***	-0,050(-0,28)
South	0,432(1,73)*	-0,457(-2,02)**	-0,068(-0,32)
West	-0,384(-1,60)	-0,114(-0,63)	0,316(1,82)*
Constant	-12,51(-9,3)***	-7,23(-7,43)***	-4,03(-5,38)***
Observations	2096		
LR chi2(51)	593,58		
Prob > chi2	0,0000		
Log likelihood	-2388,8444		
Pseudo R2	0,1105		

Dependent variable: **Participation Status**; (2) is estimated using *Disabled* as the health indicator; Variables, *Married*, *No-education*, *Other religions*, *Littoral*, are base outcomes for marital status, education, religion, and province. Values within parentheses next to the estimators are *t*-Student. ***(**){*} significant at 0.000(0.005){0.01}.

Table 11. Relative risk ratios

Variables	Public sector	Formal private sector	Informal sector
Fertility	1,747(2,10)**	1,39(1,38)	1,710(2,62)***
Sub-Health	1,611(3,82)	1,513(4,11)***	1,21(2,34)***
Disabled	0,169(-3,42)***	0,149(-4,19)***	0,412(-2,46)**

Source: Authors estimates. *Non-participation* is used as the base outcome.