Title: Evolution of fertility in Cameroon between 1991 and 2004: Sources of change and implications for future trends

ABSTRACT

Although sub-Saharan Africa still maintains the highest fertility levels in the world, many African countries have begun their fertility transition over the last fifteen years. In Cameroon for instance, the birth rate fell from 5.8 in year average of 1991 to 5.0 in 2004. Whether and how African continuous transitions depends on a sound understanding of the drivers of the recent declines in fertility.

By doing so, this study uses Cameroon DHS data and decomposition methods to examine the impact of the standard of living and the education level in the fertility trends in Cameroon Between 1991 and 2004. The ultimate goal is to contribute to a better understanding of the dynamics of fertility and hence to improve policies and programs to control fertility in Cameroon.

Keywords: demographic transition, decomposition methods, Cameroon.

INTRODUCTION

With an average of 5.1 children per woman Sub-Saharan Africa currently records the highest fertility rates in the world.

Despite this remarkable demographic vitality, signs of fertility transition occur more, thus calling into question "the African exception" in fertility. For nearly two decades, in fact, the results from various Demographic and Health Surveys (DHS) show a downward trend in the average number of children per woman in many countries of the region. Nearly 7 children per woman in the middle of the last century, fertility in sub-Saharan Africa began to decline from the 1980s and reached 6.1 children per woman in 1990-1995 and finally 5.5 children per woman 2000-2005.

In Cameroon in particular, the data show a downward trend in the total fertility rate between 1978 and 2004 with a number of 6.4 children per woman in 1978 (ENF 1978); 5.8 children per woman in 1991 (DHS-I) 5.2 children in 1998 (EDS-II) and finally 5 children per woman in 2004 (EDS-III). The results of various studies and surveys in this country show that this decrease is

greater in urban than in rural areas (DHS, 2004).

Therefore, special attention is paid to changes in fertility since the 1980s, mainly because of the fear of "macro-economic consequences of excessive population growth at all levels" (Gubry, 1988).

This study advances the state of knowledge on fertility in Cameroon, by adopting a proactive approach in its analysis of the sources of fertility decline. The analysis is based in particular on the methods of decomposition.

In so doing, the study provides useful elements for a better understanding of the dynamics of fertility. It allows to run a more effective policies and programs for the control of fertility in Cameroon. Specifically, after recalling the levels and trends of fertility in Cameroon, the study aims to determine the sources of change in the fertility of women in Cameroon.

The document is structured in three parts. The first focuses on the presentation of the literature, and more particularly the theories of demographic and fertility transition. The second part is devoted to the presentation of data sources. And the last part focuses on the presentation of the results of our analyzes.

LITERATURE

Originally developed for European countries, theories of fertility transition were subsequently adapted to the Third World and have undergone significant changes.

It was during the years 1950-1960 that T. Parsons formulated the theory of the evolution of the family in the American context. We can distinguish two aspects in his theory.

The first aspect is structuralist. The author explains that the transition from a traditional family to that of modern nuclear family results in structural changes that affect society as a whole, including industrialization and urbanization and distend family networks based on traditional kinship systems, this results in a segmentation of many family units in isolated pairs. The second aspect is functionalist. Parsons puts forward the idea that there exists a balance between the nuclear family and the evolution of American society, that is to say, the transition to modern, urban and industrialized society. His theory is based on the paradigm that the nuclear family is the form best suited to the constituent elements of modernization: monetization of production and social relations, individual autonomy, greater social and spatial mobility of workers, extended rationalization to all social activities, etc.

The traditional model of fertility transition developed by Landry (1934), Notestein (1945) and Davis (1945) focuses on the factors of economic modernization and industrialization presented as the sine qua non condition to a drop of fertility in developing countries as was the case in the West after the industrial revolution. For these authors, these factors are mortality, urbanization, literacy, rural population density and agricultural modernization (Notestein, 1945, Davis, 1945). These variables are fairly commonly accepted to precisely define a process of socio-economic modernization and industrialization.

This model gave rise to numerous revisions and criticism including that of Repetto (1978) which gave birth to the model called "sustainable development". Developed by Repetto (1978), and validated by the analysis of the transition process in Hungary between 1880 and 1970 (Cook and Repetto, 1982), it is in line with the theory of Notestein on the role of growth factors industrialization and economic but adds a third set of factors such as: the index of real wages, land redistribution, the average income of landless people, etc..

This model, although located in the perspective of the economic effect on the population, more emphasis on the redistribution of wealth between the different classes of society, on the level of economic growth. Repetto assumed that such redistribution would mitigate income inequalities between the upper classes and those most disadvantaged in society and thus constitute a powerful tool for development and social modernization, which ultimately would result in a fertility decline.

His interest is in showing that the redistribution of wealth can be the instrument to bring down the fertility rate to emphasize the relevance of a policy of balanced distribution of income, assets and knowledge for developing countries development and, conversely, the negative impact that can have strong socio-economic inequalities on a generalized decline in fertility.

In the mid 1980s, the economic crisis in many developing countries generated social consequences (increased poverty and inequality), and gradually appeared as an explanatory factor in the decline of fertility.

Analyzing the situation of sub-Saharan Africa, Boserup (1985) was the first to consider the crisis as a possible factor in fertility decline. Like other "optimistic" authors, she argues on the one hand that there is a positive relationship between population and development because she believed that population growth leads to lower per capita income and an increase in consumption, and thus a deficiency in meeting the needs.

Finding solutions for these needs is generating innovations and, ipso facto, technical progress, changes in socio-economic structures and alteration of the traditional social organization that inspires.

On the other hand, she says that if economic development must eventually lead to a decrease in fertility, an economic crisis can also cause a drop in fertility, mediated by intervening to lower cash income.

At first, this decrease in income increases relative cost of children while making it more random investment in their education. In a second step, the anticipation of economic hardship to raise a large family raised by people will result in birth spacing and limiting family size that encourages the use of contraception.

Boserup explains, in 1985 that differences in contraceptive diffusion between Ghana, strongly marked by the crisis and its economy characterized by a lower level of education and less dissemination of family planning programs, and Kenya which had the oldest national family planning program in sub-Saharan Africa and a healthier economy. For her, it is the economic hardships that hit Ghana hard that explains the higher prevalence of contraceptive use among women in Ghana, despite a lesser knowledge of modern family planning than in Kenya.

METHODOLOGY

This study uses the decomposition analyzes to determine the sources of change in fertility at the national level. To do this, we propose to test the following hypotheses:

H1: The fertility decline is due to the improvement of the education of women and that it is the most educated women who contribute the most to the decline in fertility between these two dates.

H2: The lower level of fertility is linked to social inequalities in standards of living between the two periods and the women belonging to the upper classes have contributed most to the decline in fertility between 1991 and 2004.

Definition of concepts

Social change

The term social change means any observable change in time (whether spontaneous or induced) of the structure, operation or performance of a social community. Social change covers both non-measurable qualitative aspects (e.g. laws and standards) and quantitative aspects (e.g. population growth of a country, rates of infant mortality, fertility rates). Quantifiable changes in turn may be

intrinsic to the company itself or come from the aggregation of individual behavior. In a decomposition analysis, the main sources of change are either the effect of behavior or composition effect (Eloundou Enyegue and Giroux 2010).

Effect of Composition

The composition effect is caused by the change in the changing structure of the population under study. In this case, it is the part of the change that is attributable to the change in the proportion of mothers of different social classes from one period to another.

Effect of behavior (or performance)

The effect of performance indicates the share of social change that is attributable to the change in average fertility (performance) at the various social classes. This effect can in turn be subdivided into: a) effect of basic performance, b) the effect of differential performance c) residual effect.

a) Basic performance

The basic performance means the risk of fertility decline that affects all social classes of the classification variable without distinction. This risk arises from events or policies that affect all categories.

b) Differentiation of performance (or differential performance)

It is a further subdivision of the performance effect. This is only a difference in performance related to a category of the classification variable. So we can say the performance difference due to the rich, or poor for example.

c) Residual factor

This change is not explained by the effect of performance or the composition effect. These changes are often due to spontaneous changes of any social phenomenon. In the case of fertility, for example, one can speak of economic crises, socio-cultural environment, among others.

DATA

Sources

The data used are derived from Demographic and Health conducted in Cameroon respectively in 1991, 1998 and 2004. The statistical unit of analysis consists of women of childbearing age (15-49 years) and our analyzes are based on actual 2591 women aged 15-49 years in 1991, 3540 in 1998 and 7106 in 2004.

Variable Specification

Substantive variable

This is the variable of interest; it is the social phenomenon to study. Our variable of interest is the fertility of women aged 15-49 years. The fertility indicator used is the total fertility rate (TFR) observed over the three periods (1991, 1998, and 2004).

Classification variables

These are variables that allow the subdivision of the total population (National) in several distinct subpopulations. In this study, the classification variables are designated by the educational level of the mother and her standard of living.

Analysis

The basic idea of the decomposition analysis is to quantify the relative contributions of two or more measurable factors to the social change. It is more specifically the contribution of the effect of performance and composition effect. The performance reflects the effect of change in the performance of the groups, while the effect of changes in composition indicates the relative size of the groups. Formally, the decomposition formula is obtained starting from the expression of the performance of the national population as a weighted average of performance in the various sub-populations.

$$\hat{y}_t = \sum w_{it}\, y_{it}$$

With;

y = substantive variable;

i = various categories of classification variables;

t = time;

w = number of the various sub-populations

In our study, Y represents the average number of children per woman, W and the proportions of women in each social class.

From this formulation, it is easy to see that the change in the average performance of populations can be decomposed into two elements that represent, respectively, the composition effect and the effect of the change in performance or fertility of various social categories.

$$\Delta\hat{y} = \sum \bar{y} * \Delta w_i \; + \; \sum \bar{w}\, \Delta\, y_i$$

3.3.2 Advanced Decomposition

To refine the decomposition of the effect of performance, it is sufficient to estimate the statistical relationship between performance (fertility differentiation) and maternal education on the first hand and performance and standard of living on the second hand.

$$y_{j=\alpha} + \beta * x_j + u_j$$

Differentiation of this performance is:

$$\Delta y_{j=\Delta\alpha+} \bar{\beta}\Delta x_j + \bar{x_j}\Delta\beta + \Delta u_j$$

It can then be easily incorporated into the basic equation given above

$$\Delta\bar{y} = \sum \bar{y}\,\Delta w_i + \sum \bar{w}\,\Delta y_i$$

Composition Performance

The result is a more complete decomposition (Eloundou-Enyegue and Giroux 2010)

$$(2)\ \Delta\bar{y} = \sum \bar{y}\,\Delta \boldsymbol{w_i} + \sum \bar{w}\,\Delta\boldsymbol{\alpha} + \sum \bar{w}\,\bar{x}\,\Delta\boldsymbol{\beta} + \sum \bar{w}\,\Delta \boldsymbol{e_i}$$

Composition (B) | performance de base (A1) | différenciation par classe (A2) | facteur résiduel (A3)

Performance

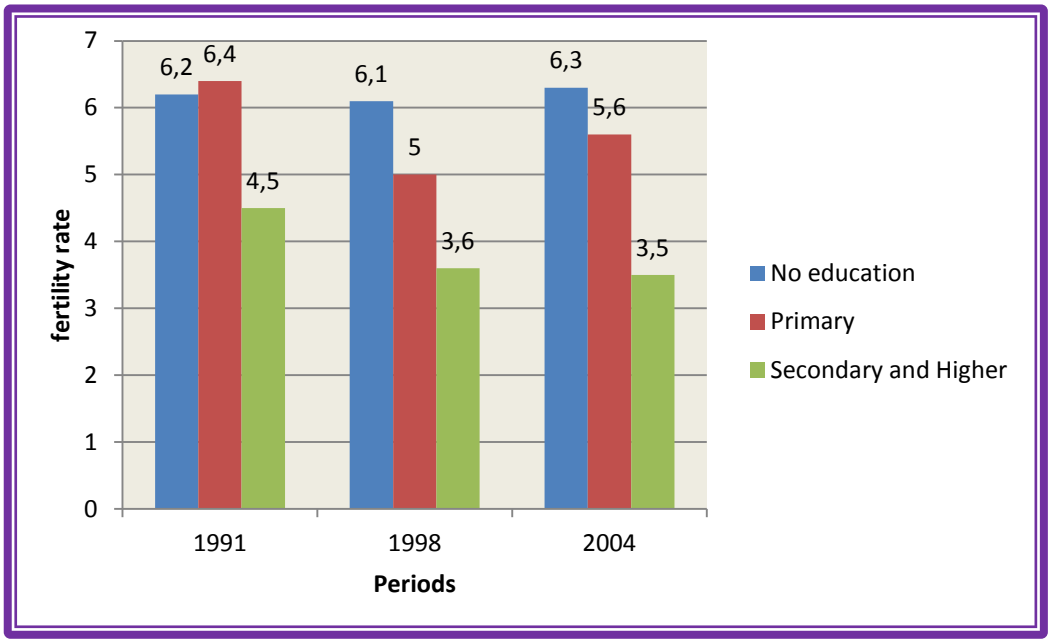
This new decomposition is finer. In addition to the effect of composition, it includes a breakdown of the impact of behavior and now comprises three sub-components, including declining fertility of all social categories (A1), the effect of the differentiation of the fertility by different social groups (A2), and the effect of residual factors (A3).

RESULTS

Globally there is a relationship between the level of education of the mother and the level of current fertility on the one hand, and between the standards of living and the fertility on the other hand. At the national level, it can be seen that the fertility is low among highly educated women and those belonging to a high standard of living.

If we consider the level of education for example, it can be observed between 1991 and 2004 a decline of total fertility gradually as the level of education increases for each period, but also between different periods. Between 1991 and 1998, the fertility decreased by 0,1 for the women with no education, 1,4 for the women of primary level, and finally 0,9 for the women with secondary or higher level. Women of the primary and secondary level or higher have contributed significantly to the decline in fertility in Cameroon between 1991 and 1998, and those with no education those who have contributed the least to this decline.

Figure 1: Levels and trends of fertility by education of the mother over the period 1991-2004.



Sources : Cameroon DHS 1991, 1998, and 2004

Between 1998 – 2004, there is a slight turnaround with increases in the level of fertility of women of all educational levels except for the secondary and higher level. Indeed, fertility increases of 0.2 among women with no education and 0.6 among women of primary level.

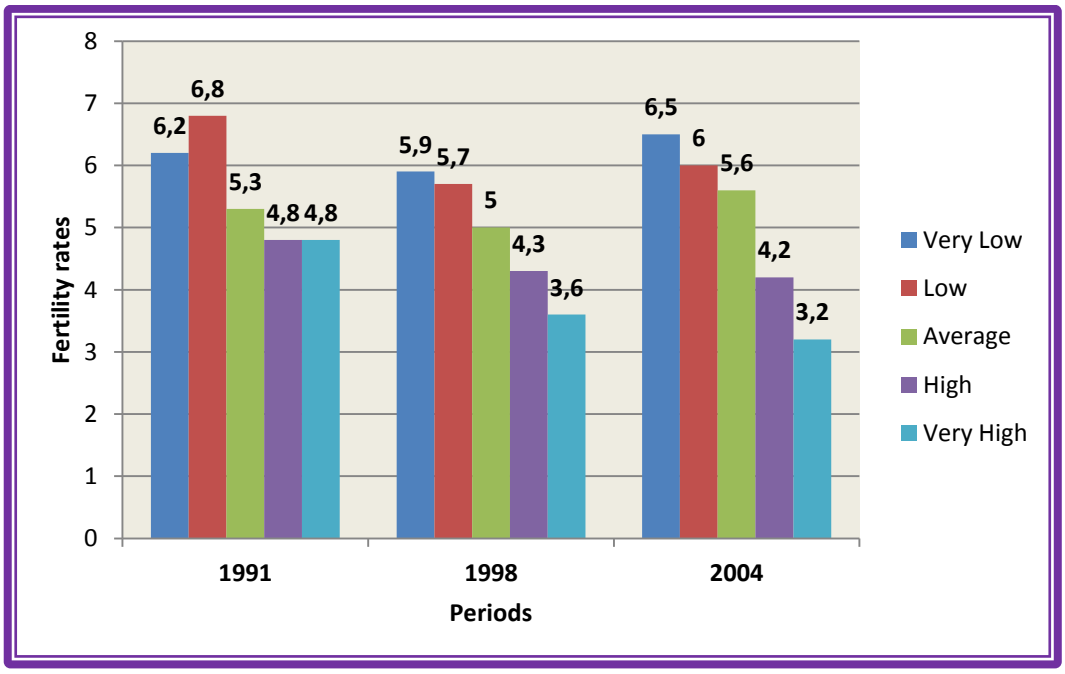
However, it decreased by 0.1 among women with a secondary and higher level.

However, the fertility level recorded in 2004 is lower than in 1991, indicating a transition to lower fertility between 1991 and 2004 in Cameroon.

Regarding the standard of living, Figure 2 shows that in Cameroon, women's fertility decline for all levels of standard of living during the first period (1991-1998). And fertility declines of 0.3, 1.1, 1.1 and 1.2 1 for women belonging to very low, low, average (medium), high and very high standards of living.

For the period between 1998 and 2004, there has been a rise in fertility levels of women in the standard of living very low, low and medium; however, that the decline observed during the first period for their fellow high and very high standard of living continues the same trend. Fertility increases of 0.6, 0.3, and 0.6 among women living very low, low and medium.

Figure 2: Levels and trends of fertility by level of mother's life over the period 1991-2004.



Sources : Cameroon DHS 1991, 1998, and 2004

Simple decomposition

Standard of living

For the period 1991-1998, the simple decomposition results highlight the preponderance of the effect of behavior or performance of social groups in the change in fertility during this period when considering the standard of living as variable of classification.

It follows in particular that the women belonging to the low and very high standards of living are those that have mainly contributed to the decline in the total fertility rate (TFR) observed during this period (48% and 42% of contributions to change respectively).

In other words, changes in behavior (by women aged 15 to 49 years between the two periods and low and very high social classes) are the main source of explanation for the decline in fertility observed between years 1991 and 1998.

Regarding the period 1998-2004, the results highlight the dominance of the effect of composition (or structure) in the change of fertility in Cameroon. At this level, we note that the change in fertility during this period was mainly due to a change in the proportion of mothers of different social classes between these two dates. More specifically, we observe that it is the increase in the proportion of mothers in the very low and low standards of living that is the main source of change in average fertility of women in Cameroon (69% and 42% respectively of contributions to change).

Thus unlike the period 1991-1998, it is more a change in the composition of different types of living which is the origin of the observed change in fertility between 1998 and 2004.

Table 1: Decomposition of the change in fertility in Cameroon according to the standard of living over the period 1991-2004

Niveau de vie	Cameroun 1991-1998				Cameroun 1998-2004			
	Effet de composition	Effet de performance	Total	Contribution des différents groupes (%)	Effet de composition	Effet de performance	Total	Contribution des différents groupes (%)
Très bas	0,04	-0,03	0,01	-1	0,07	0,07	0,15	42%
Bas	-0,11	-0,13	-0,24	42	0,21	0,04	0,25	69%
Moyen	0,16	-0,10	0,05	-9	-0,06	0,06	-0,01	-1%
Élevé	-0,02	-0,09	-0,11	20	-0,02	-0,01	-0,03	-8%
Très élevé	-0,18	-0,10	-0,28	48	0,02	-0,02	-0,01	-2%
Total	-0,12	-0,46	-0,57	100	0,07	0,07	0,15	100%
Changement	-0,57				0,36			
Contribution (%)	20,03%	79,97%			61,55%	38,45%		

Sources : Traitement des données EDS 1991, EDS 1998 et EDS 2004 Cameroun

Level of education

The results of the simple decomposition based of fertility in Cameroon when considering the educational level of the mother between 1991 and 1998 highlight the dominance of the effect of behavior or performance of cultural classes in the change occurred in fertility during this period. It follows in particular that the women of primary education level and those of secondary and high education level have contributed significantly to the decline in the total fertility rate observed during this period (95% and 33% respectively). In other words, changes in individual behavior are again the main source of explanation of fertility decline observed between 1991 and 1998.

For the years 1998 and 2004, however, the results highlight the preponderance of the effect of composition change in the fertility of women in Cameroon. In other words, the change in fertility observed during this period comes from a change in the proportions of mothers in certain cultural categories. More specifically, we observe that it is the change in the proportions of women with no education, which is at the origin of the change in the fertility of women in Cameroon.

Table 2: Decomposition of the change in fertility in Cameroon according to the educational level of the period 1991-2004

Niveau d'instruction	Cameroun 1991-1998				Cameroun 1991-2004			
	Effet de composition	Effet de performance	Total	Contribution des différents groupes (%)	Effet de composition	Effet de performance	Total	Contribution des différents groupes (%)
Sans niveau	0,092	-0,011	0,08	-28	0,2063	0,0123	0,22	-489
Primaire	-0,125	-0,153	-0,28	95	-0,0720	-0,0912	-0,16	365
Secondaire ou plus	-0,028	-0,068	-0,10	33	-0,0240	-0,0760	-0,10	224
Total	-0,062	-0,232	-0,29	100	0,1103	-0,1550	-0,04	100
Changement	-0,29				-0,04			
Contribution (en %)	20,96%	79,04%			-246,64%	346,64%		

Sources : Traitement des données EDS 1991, EDS 1998 et EDS 2004 Cameroun

Advanced Decomposition

It is now necessary to explain this change in the effect of performance distinguishing between the share due to baseline (or basic) performance (that is to say, the decline in fertility across socioeconomic groups without distinction), the share due to the differentiation of fertility of the socioeconomic categories (that is to say, the differential behavior of women from different social classes in terms of their reproduction), or the share attributable to residual factors (variables not taken into account in the analyzes).

Standard of living

It is clear from the analysis of advanced decomposition when considering the standard of living that the change between 1991 and 1998 due to the effect of performance is largely a consequence of the performance of basis (that is to say, a general decline in fertility that has affected all socioeconomic groups indiscriminately), which contributed 52% to the explanation of fertility decline observed during this period (the proportion attributable to the effect of differentiation of fertility in different socioeconomic in the decline in the average number of children per woman

is 27%). Thus the fertility decline during this period is largely due to a decreased risk of childbearing in all economic categories.

Table 3: Advanced decomposition of the effect of performance in Cameroon between 1991 and 1998 and between 1991 and 2004.

Niveau de vie	Cameroun 1991-1998		
	Effet de performance		
	Base	Différentiation	Facteur résiduel
Très bas	-0,07	0,00	0,03
Bas	-0,07	-0,02	-0,04
Moyen	-0,06	-0,03	-0,02
Élevé	-0,05	-0,05	0,01
Très élevé	-0,05	-0,06	0,01
Total	-0,30	-0,16	0,00
Contributions au changement (%)	52	27	1

Sources: Data Processing EDS 1991, EDS 1998 and EDS 2004 Cameroon

Level of education

It is clear from the analysis of advanced decomposition when one considers the level of education that the change between 1991 and 1998, mainly due to the effect of behavior is largely due to the performance of base (that is to say, a general decline in fertility that has affected all cultural categories indiscriminately), which contributed to 41% to the explanation of fertility decline observed during this period (the share attributable the effect of differentiation of the different cultural categories in the decline in the average number of children per woman is 35%).

Thus the fertility decline during this period is largely due to a decreased risk of fertility in all cultural categories.

Table 4: advanced decomposition of the effect of behavior depending on the level of education of the mother in Cameroon 1991/2004

Niveau d'instruction	Cameroun 1991-1998		
	Effet de performance		
	Base	Différentiation	Facteur résiduel
Sans niveau	-0,05	0,00	0,03
Primaire	-0,04	-0,04	-0,07
Secondaire ou plus	-0,03	-0,06	0,02
Total	-0,12	-0,10	-0,01
Contributions au changement (%)	41	35	3

Sources: Data Processing EDS 1991, EDS 1998 and EDS 2004 Cameroon

DISCUSSION OF RESULTS

Level of education

Education has a key role in the decline of fertility observed in Cameroon and is an important determinant of the latter. As Rwenge (1994) noted, education equips women with a background enabling them not to accept easily the evidence of the past, and therefore makes them much more open to modernity and individual decision making (especially when women follow higher education). In addition, educated people are also more likely to be receptive to new ideas and attempted to introduce innovations in society because of their contact with the outside world and the different cultures surrounding.

Thus, as Evina (2005) noted « *Les caractéristiques individuelles d'identification sociale de la femme déterminent sa capacité d'adhésion, d'adaptation ou de résistance aux influences de son milieu de résidence en matière de planification familiale*. »

Standard of living

The relationship between the standard of living (or poverty) and fertility has been analyzed in many studies including that of Nouetagni (2004). Indeed, he observed a negative relationship between poverty and fertility on the basis of the results of the survey in two cities in Cameroon (Yaoundé and Douala). It appears from this study that the poor give birth to more children than more affluent, whatever the standard of living indicator considered (monetary or not). However, considering the relationship between poverty and fertility future, he finds that the poorest want fewer children.

Thus, he observes that there is no significant difference in fertility between poor women and non poor about future or desired fertility, but rather the actual fertility differences occur especially due to the fact that poor women are confronted with problems of access to the means to control their fertility, and end up with high fertility.

CONCLUSION

This article aimed to contribute to the knowledge on the evolution of fertility in Cameroon between 1991 and 2004 and its macroeconomic causes. More specifically, it assesses the levels and sources of change in the fertility of women in Cameroon between 1991 and 2004.

To achieve these objectives, we used data from the three DHS conducted in Cameroon. The assumptions are as follows:

H1: the fertility decline occurred in Cameroon between 1991 and 2004 is predominantly due to the effect of behavior (or performance), and it is the most educated women who contributed most to the decline in the level of fertility

H2: also, it is the women belonging to the upper classes who have most contributed to the decline in the general level of fertility between 1991 and 2004.

The results from the simple decomposition analysis shows that between 1991 and 1998, the fertility decline nationally was mainly due to an effect of performance (or behavior) that contributes to the explanation of social change, whatever the classification variable considered. In contrast, between 1998 and 2004, it is the composition effect that contributes most to the explanation of the change in the level of fertility observed in Cameroon.

The results of the advanced decomposition of the effect of performance show that whatever the classification variable is it is the baseline (or basic) performance which is the cause of the decline in fertility between 1991 and 1998.

In order to ensure better control of fertility in Cameroon, we make the following recommendations:

In terms of policy, it is necessary to make it effective in all regions of the country family planning and reproductive health. We must also continue the efforts of educating girls, which could result in an increase in the age at first marriage and therefore may reduce the level of fertility in Cameroon. The government should finally improve the standard of living of the population and promote the fight against social inequalities.

At the scientific level, it is useful to continue the reflection at the regional level by adding a qualitative dimension to the quantitative analysis.

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