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INTRODUCTION

This thesis deals with the relationship between education and fertility in less developed countries. There is a general agreement among scholars that demographic transition is a necessary prerequisite for any country to enter in the stage of sustained economic growth. In the experience of developed countries, the demographic transition entailed a dramatic and relatively quick decline of both mortality and fertility rates. Notwithstanding growing efforts from governments and international organizations, less developed countries today face great difficulties in achieving the same goals. Whereas mortality rates are decreasing, though staying at high levels according to western standards, fertility turned out a much more awkward issue to deal with. As a consequence, the rate of population growth further increased rather than the opposite, making more difficult to direct resources from basic sustainment to investments. Scholars and policy makers acknowledge today that most family planning programs have been largely unsuccessful, and give pride of place to education as the best way to reduce lower fertility, not to mention with many other positive externalities. The thesis is divided into two main parts. In the first part, I review the relevant literature on economic development, demographic transition, and the role of education. In the second part, I provide empirical evidence on the impact of education on fertility reduction. To this purpose, I use data drawn from the Demographic and Health Surveys (DHS) on Sub-Saharan countries. I adopt a micro-analytic approach, using the methods of Event History Analysis to model the risk of a new birth.

CHAPTER 1

1.1 The Demographic Transition

In the latest half-century, most world populations experienced dramatic changes in their demographic behaviours. In 1960, the fertility rate (total birth for woman) in the Western World was around 3; in 2011 it was around 2 children per woman (www.worldbank.com). The evolution was quite different in less developed areas, such as Sub-Saharan Africa (SSA). Here fertility rates were exceedingly high at the beginning of the period, generally around 6, but a significant divergence took place in the following years, so that in some countries the fertility rate declined to 3, whereas in others it further increased to 7.

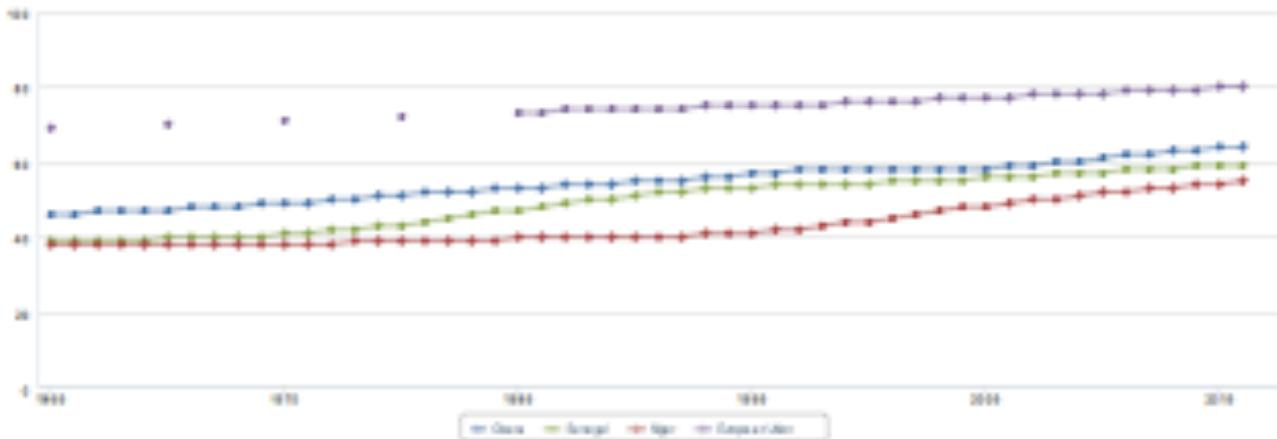
Figure 1.1 : Births per woman in SSA, 1960-2012



Source: World Bank

The same is true as far as mortality is concerned. In the US, life expectancy at birth rose from 70 years in 1960 to 80 in 2011. In SSA life expectancy at birth was 40 years in 1960 and reached 54 years in 2011: in both cases, the average length of life increased by around ten years, but the patterns of mortality involved are obviously quite different, with infant and child mortality playing a primary role in African survival gains. Furthermore, there are relevant differences among sub-Saharan populations as well (www.Worldbank.com).

Figure 1.2: Life expectancy at birth in SSA, 1960-2012



Source: World Bank

As these data show, on the one hand the western countries experienced both a fertility and mortality decline well before the less developed countries (LDC). On the other hand, among LDCs themselves there are huge differences in the timing and the result of the process. All these issues are part of the so-called “demographic transition”, which are shortly outlined below.

1.2 The consequences of the demographic transition

The demographic transition represents the passage from a demographic regime characterised by high fertility and high mortality, to a regime where both fertility and mortality are low. Although the difference in terms of growth rate can be null in principle, as long as the difference between death and birth rates remains the same, actually such a process affects in a deep and irreversible way the social and the economic characteristics of a community. “Transition transform the demography of society from many children and few elderly, to few children and many elderly; from short life to long; from life-long demand for women to rise young children to the concentration of these demands in a small part of the adulthood; from horizontally rich kin networks to vertically rich ones” (Lee and Reher, 2011: ***).

This transition is related to four main processes, which have a strong impact on societies.

First, the age structure of the population changes. When the number of births begins to decline, the first effect is a growing, if temporary, importance, in relative terms, of the working-age group of the population. However, as the reduction of fertility stabilises and life expectancy increases, the final outcome is the growing weight of the elderly. This result has important consequences for the social and economic structure of the society.

Second, the nature and structure of family relationships also change, in parallel with larger changes in societal organisation. Families become smaller (due to lower fertility) and more developed along the vertical lines (due to population ageing) than the horizontal lines. The structure and composition of kin groups change, and their importance in family life modifies correspondingly. Parents and grandparents, rather than kin, play a key role for household activities and evolution. Of course, also this process has important implication both from a social and economic point of view. A family-centred economic system, where the welfare of household members has the greatest importance, is replaced by a capitalistic economic system, where primacy goes to individuals (Caldwell 1980).

Third, there are huge consequences on women life and women position in society. Women pass from rearing children almost all life long, to concentrating their reproductive activities in shorter and consciously selected periods. As a consequence, they have more time for education, work, and leisure. They acquire more independence and a more active social role. This of course changes the balance in the relationships with men and children. Overall, women redefine their role in the family and society

Fourth, before the transition children were important contributors to the household budget, and were supposed to work in order to support the elderly and their younger siblings. After the transition, children become precious assets for future return. Their value is no longer in the present but in the future. Childhood and youth become a stage of maturation and formation, in which the higher is the effort in terms of education and experience, the higher is the expected income available during adulthood and the old age. It is only the adults who are supposed to support the family.

1.3 Explanations and consequences of the fertility decline

Scholars have long debated about the causes of the fertility decline that involved a large part of the world populations in the last two centuries of human history. Roughly speaking, most demographers argued that the demographic transition was one of the consequences of a larger economic, social, and cultural process, which we can label for short as “modernisation”. Other scholars, however, tend to stress that it was the demographic transition itself, and more precisely the dramatic decline of fertility rates, that made all the other main changes possible. Needless to say, also more nuanced versions have been proposed, supporting a view of the positive feedback between modernisation and fertility decline as a cumulative and self-reinforcing process.

It was Frank Notestein (1945, 1953) and his colleagues at the Office of Population Research in Princeton who first put forward the theory of the demographic transition as by-product of larger economic and social changes. The main reason for this interpretation was the concomitance between these two processes. From 1850 onwards, the western world experienced dramatic changes in all aspects of economic and social life: living standards and access to education arose; people moved to towns; the industrial and service sectors became more and more productive and important in comparison with the agricultural one; women joined the labour force massively; free time and consumption became an inalienable outcome of individual labour, while subsistence was no longer the primary human aim. Increasing survival and declining fertility were just a part, and a consequence, of these broader transformations, which were all synthesised under the label of “modernisation”.

However, it turned out that the relationship between socioeconomic changes and demographic behaviours was not as straightforward as it was supposed to be. In 1963, a large cooperative project was undertaken at Princeton, under the direction of Notestein's successor Ansley J. Coale (1973, 1986). In a 23-year research work, some of the most eminent demographers in the world, involved in the Princeton European Fertility Project, collected and analysed statistical data about fertility and related socioeconomic variables of several hundred European provinces in the period of major fertility decline, in order to test the association between reproductive behaviour and various indicators of modernisation. Results were quite disappointing, showing that areas with similar levels of modernisation displayed different patterns of fertility decline, whereas countries with different socioeconomic features experienced similar demographic processes. While downplaying the importance of socioeconomic change, the Project stressed the importance of ideational factors, based on ethnic, religious or linguistic peculiarities (see Szoltysek 2007 for a useful summary).

Whereas research of the causes of fertility decline seemed to loose its strongest paradigm, leaving scholars free to explore alternative and heterodox explanations, only few tried to see the question from an opposite point of view, arguing that it was the demographic transition which provided the most important trigger of modernisation. David Reher is one of these authors: in a recent paper (2011) he stressed that the demographic transition was one of the main causes of the radical changes which the world experienced since the nineteenth century, and that it had deep social, economic, psychological and ideational consequences.

Reher considers the social, cultural, epidemiological and economic context of the nineteenth century, characterised by different flows of innovation. In particular new knowledge and techniques in the field of medicine and healthcare and better standards of living lead to a decline in child mortality, eventually followed by a similar decline in infant and adult mortality. As a consequence, couples began to control their reproductive activity, decreasing the age at last birth (the so-called early stopping) and increasing birth intervals (spacing). The increasing adoption of birth control made possible to anticipate the age at marriage without consequences on fertility: the Malthusian preventive check was no longer necessary.

Such demographic changes set the processes that, in a direct or indirect way, favoured new social and economic outcomes. In the long run, the age structure of the population was deeply modified, from a top-down to a bottom-up structure. As a consequence of the reduction in the number of children participating to family sustainment, people were active until older age and reduced their dependence from the younger members of the family. Moreover, in the first stage of the demographic transition there was a temporary surplus of people in working age, pushing to both internal (from rural to urban areas) and external (from country to country) migrations. In its turn, this gave place to important social dynamics: urban growth, higher participation in the labour force, acquisition of new skills, lower population pressure, and social mobility.

Furthermore, the associated decline of both early mortality and fertility promoted investments in children quality, thanks to the lower probability of investment waste due to the anticipated loss of a child, and a higher probability of a substantial return in the future. Overall, this allowed the formation of a better nourished and a better educated labour force. Equally important were the changes in the condition of women. Having fewer children to rear and stopping reproduction at younger age, mothers could dedicate more time to their own welfare, or find an occupation, and participate in the social and economic life of the community.

Indeed, this is what happened in the western world and is also taking place in several developing countries, in Asia and Latin America. However, Reher also stresses that the positive effects of the demographic transition cannot be taken for granted. Much depends on how economies and societies are able to take advantage of the “window of opportunity”, in Reher’s terms, which is temporarily opens to them. Reher points out three main factors determining the length of such a window: the speed of the demographic change, the level of population growth rates following the initial decline in mortality, the methods used to check population growth. Whereas these conditions were favourable to the development of European countries in the nineteenth and twentieth centuries, and in other non-European countries in the twentieth century, they might not be as favourable in other LDCs. As a consequence, the window of opportunity might not remain open long enough for these countries to undertake the necessary economic and social changes.

Reher argues that the demographic change was much faster in earlier transitions than it is in many of the poorest countries, as in SSA. In most transitions, mortality declines faster and earlier than fertility, giving place to a temporary increase in population growth that can be beneficial to economic development, provided that certain conditions are met. However fertility decline must also follow soon, otherwise economic growth will be soon impaired by population growth. This is the situation of SSA, where mortality was reduced, also thanks to the availability and the support of western technologies, but fertility did not decline correspondingly. In some cases, it actually increased, thanks to the general improvement in health conditions.

Another difference between earlier and later transitions concerns migrations. In the nineteenth and early twentieth centuries, the surplus population produced in the early stage of the transition could migrate to areas where there was a structural lack of labour force: both the sending and the host countries were favourable to migration and promoted it. This is no longer the case today, since host countries try to strictly regulate the admission of immigrants. Where no mass migrations are possible, the only alternative way to reduce the population pressure is to resort to some forms of family planning, which are however more difficult to implement.

As a result the positive effects of the demographic transition and the economic progress in general are stifled by population growth and better economic performances are not enough to improve living standards. Also in LDCs the demographic transition is a powerful source of economic and social changes. However its positive effects might be delayed, though hopefully not cancelled, by stronger constraints.

1.4 Population change and economic development: the Unified Growth Theory

Reher's efforts to highlight the social and economic consequences of the demographic transition are quite exceptional: understandably, demographers are more interested in pointing out the factors that influence demographic behaviour rather than in showing its consequences on economy and society. Correspondingly, economists tend to disregard the role of population dynamics in economic processes, somehow forgetting the great Malthusian lesson.

There are however notable exceptions, where the interactions between population and economy are given pride of place. One of the most interesting example is the work of economist Oded Galor and his several colleagues, who developed a new *Unified Growth Theory* where the demographic transition represents the core of any sustained growth process (Galor 2011). In this, Galor follows the same line of thought as Reher. However, in support to his view, Galor develops a formal and sophisticated model outlining the interdependency between population, economy, and society, whereas Reher adopts a descriptive and narrative approach.

Galor labels his theory as “unified” since it formally describes a model that is equally valid before, during, and after the industrialisation process. In this, he argues that his theory is superior to the most popular growth models, such as the Exogenous Growth (Solow 1956) and the Endogenous Growth (Romer 1986; Arrow 1962) models. As is well known, the Exogenous Growth Theory holds that growth is possible thanks to external factors (e.g. technical progress). Endogenous economists try to incorporate in their models the factors that account for economic growth, specifically through the enhancement of a country’s human capital. Recently new dissatisfaction grew among scholars. The Endogenous Growth Theory is not consistent on the long run, with some differences in empirical regularities in the economic path of developed and developing countries. What is more important, neither the Exogenous nor the Endogenous theories describe properly the pre-industrial stagnation and the industrialisation process.

Galor’s purpose is to explain the passage of an economy from the Malthusian epoch to sustained growth in a consistent way along all past, present, and future paths of the economy. Moreover Galor aims at explaining, without discrepancies, the different timing and/or speed that this process takes in different parts of the world.

1.4.1 Malthusian, Post-Malthusian and Modern Growth Regimes

According to Galor, three different stages of human history – or regimes – can be detected: the pre-industrial period or Malthusian regime; the post-Malthusian regime; the modern growth regime. The first stage was common to all societies and lasted for the largest part of human history, from 100,000 BCE to 1760 CE in developed countries, and to 1900 CE in LDCs. The second stage lasted until 1870 in developed countries, while is still on-going in LDCs. Finally, the third period concerns only the developed countries.

The Malthusian regime has some important features:

Income per capita and life conditions were bound to the subsistence level; additional resources were invested in new offspring.

Technological progress did not affect living standards. When progress increased the available resources, the income effect prevailed in household choices and population growth absorbed the new resources available.

The growth rate of income per capita was negligible: income did not differ significantly from year to year, but also from country to country.

Population and technologic dynamism: even if the situation appears almost unchanged along centuries as regards income per capita, this stagnation was the result of a run and chase dynamic between technology and population.

In short, the regime was dominated by a “Malthusian trap”, which made impossible to get off from long-term stagnation and start economic growth. There were changes in productivity, but the growth rate of technology was always offset by the growth rate of the population.

In the post-Malthusian regime population grows as a consequence of technological progress and income increase, but the escape from the Malthusian trap is possible because the rate of technological progress is greater than population growth, and the additional resources generated are not totally absorbed by a higher level of population. Therefore the most important feature of this epoch is an increase in productivity and an increase in income per capita. It is worth noting that the post-Malthusian regime started in different part of the world with different timings: in Western Europe and the Western Offshoots it took place about 100-150 years before Latin America, Asia, and Africa. This fact had important consequences on the distribution of income across the world. In 1870 the average income per capita in the Western Offshoots was \$2,430, in Western Europe \$1,970, in Eastern Europe \$870, and in Latin America \$700. In Asia it was \$540, and in Africa \$440: a cleavage that is still persistent today.

The post-Malthusian regime is a transitory stage leading to the modern growth regime, but there are large differences in timing. Whereas in developed countries this latter stage started at the end of the nineteenth century, among LDCs some regions are still far from experiencing a sustained growth. The main features of the modern growth regime are: rapid industrialisation; human capital formation; increasing relevance of human capital formation to physical capital; increasing demand of skilled labour (in the second part of the industrialisation process) and rising level of workers education.

The key element of the passage to modern growth is however the demographic transition. As Galor (2011: ***) put it, “the demographic transition freed the growth process from the counterbalancing effect of population growth. It enabled economies to divert a larger share of the benefits of factor accumulation and technological progress to the enhancement of human capital formation and income per capita, thus paving the way for the emergence of sustained economic growth.”

1.4.2 The triggers of demographic transition

As anticipated before, for Galor, the event that triggered the “jump” to the modern growth economy has been the demographic transition (DT).

According to Galor this is a period where the rate of technological progress and factor accumulation increased income per capita without the preventing role of population growth. Before DT high fertility rates and a sustained rate of population growth absorbed all available resources, while after the DT the reduction in fertility rates and population growth assured higher income per capita.

From an economic point of view the consequences of the DT have been an increase in labor productivity and in the growth rate of economy, elements that pave the way to the “modernisation”.

The reasons for this change are mainly three:

-more resources per capita: less people could enjoy higher stocks of capital and infrastructure;

-lower fertility rate: there is a shift of households’ preferences from quantity to quality of children. This enabled families to better educate their sons, and more skilled worker are able, if there is capital to exploit, to produce more;

decline in fertility rate: a consequence of this is that an higher fraction of people enter in the labor force.

Galor (2011) indicates five possible triggers for DT:

the rise in income per capita;

-the decline in infant and child mortality;

-the rise in demand for human capital;

-the decline in gender gap;

-the old-age security hypothesis.

1.4.2.1 The rise of income per capita

The claim that the trigger of the demographic transition was the rise of income per capita was supported by Becker (1960) and by Becker and Lewis(1973).

The Beckerian theory claims that lower fertility rates are the result of higher per capita income because higher household income increases the opportunity cost of raising children. However Galor(2011) argues that this is not the case. In fact when households experience an increase in income two main effects take place: the income effect (higher income implies higher resources that are allocated in more children) and the substitution effect (higher income makes rearing children more costly than working and therefore households choose to have less offsprings). In the case that households have homothetic preferences, income and substitution effects cancel each other and an increase in income does not have any impact on fertility. As a result, the Beckerian theory is not robust, assuming that the substitution effect prevails on the income effect.

1.4.2.2 The decline in infant and child mortality

Also the second possible explanation for DT is criticised by Galor(2011) as non robust from a theoretical point of view, and without empirical supporting evidence: the trend of fertility does not follow the same trend as mortality, so that in most historical and contemporary experiences when mortality begins to decrease, fertility remains at the same high levels as before mortality decline.

1.4.2.3 The old-age security hypothesis

During the Malthusian period parents consider offspring as an investment for their old age. However when the modern regime begins and a new economic and welfare system takes place, elderly parents do no need to rely on children's support. Also such an hypothesis, however, is disproved by empirical evidence.

1.4.2.4 The rise in the demand for human capital

According to Galor, the rise in the demand for human capital is one of the most important triggers for the DT. During the post-Malthusian regime there was first an increase in the importance of investments in human capital and then an increase in the demand of skilled labour that made human capital and education necessary. Therefore the child quantity-quality trade-off became a central issue for households. In the Malthusian trap this dynamic does not take place since technological progress is too slow. On the contrary, during the Malthusian period an increase in the demand of human capital and skilled labour increases the return of investment in education and makes profitable for households to invest in it. As a result, the quality of children takes over their quantity and fertility decreases.

1.4.2.5 The decline in gender gap

When mental tasks become important in the working place, women are usually more productive than men, though often receiving lower wages. Therefore from the beginning of the nineteenth century the participation of females in the labour force increases. This dynamic cut down the gender gap between males and females in the society and causes a decrease in fertility. When females are employed both an income and a substitution effect take place: they earn more, but they have also less time to rear children and therefore the cost-opportunity of rearing children is higher. However the difference this cost makes is higher than the difference in females' income, so that the optimal solution for households is having less children. The substitution effect wins.

To sum up, among all the possible triggers of the demographic transition, the most convincing and robust ones are the rise in the demand of human capital, and the decline in the gender gap. As a result, human capital formation and education are key elements for DT.

1.5 The influence of education on fertility

Although Galor was the first to frame the relationship of education and fertility in a general and unified theory of economic growth, several other scholars highlighted the reciprocal influences of economic development, human capital formation, and fertility decline.

Hereafter I will shortly discuss some of the works that investigated these issues.

The main arguments of the debate are:

- the direction of the relationship: some scholars claim that it is education that influences fertility, some others the opposite;
- the type of effect this relationship produces: both direct and indirect effects of the relationship between education and fertility are studied in order to understand their magnitude and role in the DT. If effects are direct, we need to focus on the effect of the parents' education in their reproductive behavior, or on the role that education has in shaping the quantity-quality trade-off for childbearing. If effects are indirect, we need to define the intermediate variables affected by education and their influence on fertility;
- which other variables concur with education to shape fertility behaviour.

1.5.1 The direction of the relationship

Wojtkiewicz and McDonald (1987) give a useful summary of the debate in the paper "A mimic model for the relationship between education and fertility". Some researchers claim that the relationship follows the direction from fertility to education: if young girls become mothers they would have no time left to go to school and therefore disruption of schooling is an effect of early first birth (Trussel 1976; Card and Wise 1978; Moore et al. 1978; Waite and Moore 1978).

However other authors believe that the relationship is in the other direction, from education to fertility: it is the level of education of the mother that influences age at first birth (Cutright 1973; Rindfus et al.1980; Ridfus et al. 1984). The solution of the problem is not straightforward. Indeed, some researchers believe there is not a single direction of causality but a double direction. Among these Moore and Hoffert(1980), for example, consider the effect of factors belonging to the family background on three main outcomes: education of women, age of the women at the first union and at the first birth. They first find out that there is a reciprocal relationship between education and fertility. Secondly, on one the one hand, age at first birth is directly affected by education, ethnicity and strength of family union; on the other hand, education is influenced by age at first birth, age at first marriage, number of siblings, socioeconomic status of the family, strength of family union and cultural level of the parents and relatives. This highlights some dynamics of the process. Also Rindfuss' works (Rindfuss et al. 1980, Rindfuss and St.John 1983) explore the same issues. This author investigates the effect that factors such as ethnicity, father's occupation, religion, number of children, region, family orientation, fecundity have on both the education level of the women and age at first birth. Rindfuss concludes that age at first birth is negatively influenced by ethnicity and positively by religion, fecundity and education. Education attainment is negatively influenced by ethnicity, religion, region and number of siblings, and positively by paternal occupation. Surprisingly, Rindfuss argues that education influences age at first birth, but not the contrary.

Michael (1975) takes as given that the relationship between education and fertility has a negative direction and tries to find an empirical explanation of the fertility behaviour of households. He explains that the influence of education on fertility is not only related to the use of contraceptive methods, but also on the choice between quantity and quality of children. He considers the household has a firm, which uses inputs from the market, for example consumption goods, to generate outputs which give it utility, among which children services. Finally he tries to give a definition of "quality" of children describing it as the human capital in the child. The conclusions he gets show that "the negative relationship observed between education and fertility probably reflects the indirect effect of education through the economic factors of income and value of couple's time. Beginning with this simple relationship, we can attempt to separate out the effects of income and the value of time to determine the direction and magnitude of any remaining effect of education on completed fertility" (Michael, 1975).

Another important contribution on the issue is given by Basu (2002). This author underlines that, despite the many different results on the type of factors that cause fertility decline, the status of the mother and the education of the mother are the common ingredients that reduce fertility. Basu also claims that education influences fertility through the status it enables women to reach. Education enables women to increase the control they have on their lives and their resources, to reduce the gender gap with men, and increase female autonomy. Moreover Basu investigates what other instruments affect fertility through education. She highlights the decline in mortality and the rise of individual aspirations as “factors that stand out and might help us to understand the pathways through which female education has such a strong inverse impact on fertility, whether or not it reduces the gender gap between men and women” (Basu 2002: ***). Precisely, on the one hand, the decline in mortality modifies the supply of children; on the other hand, the rise in aspiration reduces the demand for them. When mortality is high there is a high demand for children which ends up in an excess of demand over supply, even if there is high fertility. When mortality decreases, also the demand for children decreases, and an excess of supply arises; then equilibrium can be achieved through lower fertility. The mechanism is clear, but the central question here is if education really has a negative effect on mortality. For Basu the answer is “Yes”, education has a clear, significant negative effect on child mortality for women. Child mortality does not depend on the gender gap or its wideness, mortality depends on other abilities of the women different from her role inside the family. When mothers are educated they are able to modify their environment for child survival, lowering the risk of death. To sum up, when a mother has some education she is able to better protect her children and the risk of death decreases. Therefore the supply of children is likely to be higher than the demand and the only way to reach the equilibrium is to reduce fertility.

The rise in aspirations works in a different way. Usually more education is associated with the desire for smaller families: a better educated mother is able to have a broader access to mass media and therefore she is the recipient of information both on “modern” values and modern methods of birth control. Mass media conveys western values (individualisms, consumption, leisure time, small and happy families with healthy and educated children, ...) and such stimuli push households to increase their control on births. Precisely households make an investment if there is the possibility to do it, if they are informed on this possibility and if they consider this investment important. Mass media inform on education and make it attractive creating a priority for the family. Therefore education and mass media change the aspiration, the preferences of the household and so change the resource allocation scheme.

The work of Basu shows how complicated the relationship between education and fertility is. In this regard Cochrane (1986) underlines some methodological issues. The fact is that education has both a direct and indirect influence on fertility. Therefore, to measure its direct effect we need to control for the intermediate variables on which education has some direct influence and that affect fertility themselves. A summary of the situation is given in table 1.1. In this table there is the direction of the bias (overestimating or underestimating), but not the magnitude, which depends on other factors. Another problem is the spurious correlation that might exist between education and some variables, for example age and residence. Quoting Cochrane (1986): “In developed countries, younger women are generally more educated than older women, and of course age is highly correlated with number of children ever born. Therefore, if age is not controlled, the effect of education on fertility will be overestimated. Likewise, education tends to be higher in urban than in rural areas, and fertility is generally higher in rural than urban areas. Thus if residence has effects other than those through education and if it is not controlled, education’s effect will be overestimated”. Finally Cochrane observes that another reason why the relationship education-fertility is complex is that sometimes education is effective only after a certain threshold.

Table 1.1 Direction of the IV and their bias

INTERVENING VARIABLE (IV)	EFFECT OF EDUCATION ON IV	EFFECT OF IV ON FERTILITY	BIAS IN EDUCATION EFFECT IF CONTROLLING FO IV WITHOUT ADDING INDIRECT EFFECT
SUPPLY OF BIRTH			
Age at marriage	+	-	+
Breastfeeding	-	-	-
Abstinence	-	-	-
DEMAND FOR CHILDREN			
Income	+	?	?
Wealth	+	?	?
Female wage	+	-	+
Mass media	+	-	+
Female labor participation	+	?	?
Child labor participation	-	+	+
Child schooling	+	-	+
Child survival	+	-	+
Perceived cost of children	+	-	+
Perceived benefits of children	-	+	+
Migration	+	-	+
FERTILITY REGULATION			
Contraceptive use	+	-	+
Knowledge of birth control	+	-	+
Access to birth control	+	-	+

Source Cochrane, 1986.

As Cochrane (1986) also Castro Martìn (1995) underlines that education is effective on fertility trends only after some threshold level of educational input is passed. Castro Martin(1995) explains that the effect of education on fertility depends on the point occupied by a country on the Demographic Transition path: among developing countries there is no uniform pattern that proves the negative influence of education; instead a U-shaped, inverted relation is observed. In fact the consequences of education on a family's fertility behaviour depend on the point where the country is in its DT path. In the early stages of DT education increases fertility and reduces mortality, assuring better nutrition and health for the mothers, and helps overcoming some traditional negative practices. Then when households learn how to control births, education-induced contraceptive use helps lowering fertility. Finally, when fertility has stabilised at a low level, education loses its negative effect (Castro Martìn, 1995). Therefore education has different consequences on fertility when it comes to analyse the relationship. Due to the importance of this variable, Castro Martìn claims that education is a fundamental right for women and a primary goal for the development of a country. Government efforts to increase literacy and improve school services and school attendance have been relevant, but there is still so much work to do.

The author focuses her analysis on some points: the fertility gap, the trend of age at first marriage and the fertility preferences.

The analysis of the fertility gap (table 1.2) shows that in some regions the fertility gap between educated and uneducated women is significant, however the magnitude of this gap follows the timing of DT.

Table 1.2 Average Fertility Rate per region and age of education differential

REGION/ COUNTRY	AVERAGE	DIFFERENCE 0 - 4/6	DIFFERENCE
SSA			
Botswana	5.0	-0.8	-2.8
Burundi	7.0	-0.3	-2.8
Ghana	6.4	-0.7	-2.2
Kenya	6.7	0.3	-2.6
Liberia	6.6	0.7	-2.6
Mali	6.9	-0.4	-2.3
Senegal	6.6	-1.5	-3.4
Togo	6.6	-1.2	-2.4
Uganda	7.3	-0.7	-2.4
Zimbabwe	5.7	-1.0	-4.0
North Africa			
Egypt	4.7	-1.5	-2.3
Marocco	4.9	-2.6	-3.3
Tunisia	4.4	-1.4	-2.5
Asia			
Indonesia	3.4	-0.2	-1.2
Sri Lanka	2.8	0.1	-0.1
Thailand	2.4	-0.1	-2.0
Latin America/ Carribbean			
Bolivia	5.1	-0.9	-3.4
Brazil	3.7	-3.3	-4.5
Colombia	3.3	-2.0	-3.8
Dominican Republic	3.8	-1.4	-3.2
Ecuador	4.3	-1.7	-3.8
El Salvador	4.4	-2.1	-3.5
Guatemala	5.6	-2.7	4.2
Mexico	4.1	-2.4	-4.0
Perù	4.5	-2.8	-4.9
Trinidad and Tobago	3.1	1.3	0.6

Source Castro Martin, 1995

Countries that are in the middle of the DT show the largest gap, while SSA registers the smallest. Moreover SSA shows some changes in the fertility levels only after the second stage of education has started: the fertility gap between 0-4 years is lower than 111%, while it reaches 121 131 % for the gap between 0 and 10 years of education. This seems to confirm the claim that education affects fertility only after a certain threshold is reached. In high fertility countries, where the spread of education services is deficient, a small amount of school does not have the expected influence on fertility. Even if at an individual level the ability to read and write changes the life of women, at an aggregate level, the effects of education are linked to the amount of population receiving some education rather than to the level of learning reached by few people (Caldwell 1980).

Table 1.3 Average Age at first marriage per region and age of education differential

REGION/ COUNTRY	AVERAGE	DIFFERNCE 0 - 10+
SSA		
Botswana	25.3	2.9
Burundi	20.0	2.9
Ghana	18.4	2.2
Kenya	18.8	5.2
Liberia	17.8	4.8
Mali	15.7	3.6
Senegal	16.8	7.7
Togo	18.6	5.6
Uganda	17.4	6.0
Zimbabwe	19.1	5.2
North Africa		
Egypt	19.5	6.8
Marocco	19.8	7.4
Tunisia	22.1	3.9
Asia		
Indonesia	18.4	7.0
Sri Lanka	22.9	4.2
Thailand	20.8	7.0
Latin America/ Carribbean		
Bolivia	20.6	3.0
Brazil	21.3	5.5
Colombia	21.2	7.9
Dominicam Republic	19.2	6.9
Ecuador	20.4	5.0
El Salvador	19.1	4.9
Guatemala	20.3	6.1
Mexico	20.3	6.9
Perù	21.0	6.2
Trinidad and Tobago	19.7	2.9

Source Castro Martín, 1995.

Education affects also the trend of age at first marriage (table 3): low educated women marry from two to eight years before high educated women. Therefore, assuming the onset of sexual activity corresponds to marriage, this trend will influence the number of members in each family. Finally education matters also for lowering the ideal number of children (which is high and very close to the actual one in SSA). It tends to make women aware of the costs of child bearing and increases the importance given to the quality training of the children. It rises the aspiration of mothers for the future of their children, and they realise that gains are possible only with a lower number of siblings.

Moreover Castro Martín worked also with Juárez(1995) to investigate why the outcomes of child schooling hold for years and shape lifetime fertility, and why schooling influences women's lifetime fertility even if it does not deal directly of sexual and contraceptive behaviour. The education effect operates on multiple levels.

First of all education transmits new knowledge and teaches women how to acquire this knowledge in an autonomous manner. Thanks to schooling, women become able to acquire information from different sources. Especially, mass media become the fundamental means of knowledge for the sources or the producers of contraceptive methods. Therefore the cognition of practical matters, such as the ones dealing with fertility control, increases with education, even if they are not direct issues in the daily class schedule. Schooling gives women a better perception of themselves, from a psychological and a physical point of view: educated women know their body and its dynamics better and so they can use contraceptive methods successfully.

Educated women are more likely to live in urban regions and to have higher household income, therefore having more stimuli and opportunities to shape their own existence.

Finally education is a driver of attitudinal changes. One can imagine attitude toward life as a segment. On the one hand of the segment there is a fatalistic approach to life, on the other hand a controlled approach, through which women control their lives and reproductive choices. When a woman receives some education she is able to find a way to get to her desires, controlling the amount and the timing too, that is she is able to pass from a "fatalistic" to a "desired" existence.

To sum up: “The educational experience has long-lasting implication for women’s lives because education serves as a source of knowledge and cognitive skills; as a resource that enhances social opportunities and social mobility; and a socialisation process that shapes attitudes, values and aspiration [...] Education also conditions women choices in the domain of family and work. Since education has such a pervasive effect in shaping the whole spectrum of women’s role, reproductive behaviour obviously cannot elude its influence”(Castro Martin e Juárez, 1995).

If Castro Martin works on the effect of education on the single woman, Caldwell(1980) focuses on mass education. He defines mass education as the primary element that causes the onset of fertility transition, influencing especially the timing of this phenomenon. Thanks to mass education family economy changes, the direction of the flow of wealth established among the members of the households is inverted. From a family-based production system, where children are investment assets and are “used” to support the older generation, we pass to a capitalist production system, where a child is more a consumption good. With education the aspiration of the individual for himself and his children change. The timing of the transition from one model to the other is determined not by the rate of economic or occupational change, but by the type of cultural superstructure and the type of economic organisation of the family that is linked to this superstructure.

The production structure of a family is strictly related to the type of morality the members of the family share. In the family morality system at the top there is a patriarch, who exercises authority, and then all the other members of the family come, from the older to the younger. Children are taught to be industrious, modest, respectful and to contribute to the flow of wealth that goes from the younger to the older members of the group. High fertility rates are not an obstacle to family success, as it is in the capitalist production system, instead parents of a high number of siblings are honoured for the respect due to the elders. Caldwell claims that this type of family morality is an obstacle to development, and that it is able to survive to economic changes as long as religion and social rules sustain it. On the contrary it is not likely to survive a change in the morality of the community, as the one promoted by the mass education system. “The greatest impact of education is not direct but through the restructuring of family relationship and, hence, family economies and the direction of the net wealth flow”(Caldwell, 1980).

The channels through which mass education acts are mainly five:

1. schooling reduces the potential capacity of children to contribute to the work in the family. Moreover the other family members consider him as “elected”, intended to work hard at school and to be able to access to high, new, non-traditional job and status. Therefore this child is prevented from familial works to save his energies;
2. school attendance grows considerably the costs associated with children. Having a child that attends school means new costs within and outside traditional family life, to enable him or her to have the same opportunities as his/her counterparts;
3. school creates dependence: children pass from producers of the family wealth to precious assets that are currently maturing for a future high return;
4. education makes culture change. The model of society it describes is not based on family links and production, but on a broad society and a capitalist economy. The mind of the children is open toward new knowledge and values;
5. school is propaganda, and especially propaganda of the western values and lifestyle. As a result, educated children are somewhat alienated from their own traditional culture, and begin to look at it as the non-school, anti-school world.

John Caldwell together with Pat Caldwell is also the author of another interesting paper (1987): “The Cultural Context of High Fertility in Sub-Saharan Africa”. This paper describes the religious background of SSA and its influences on the fertility behaviour of individuals. The characteristics of the traditional/animist religion of this region are, for Caldwell, one of the main drivers of the great resistance the decline in fertility comes across in SSA. The main feature of the traditional religion is the role, the importance and the power attributed to family ancestors. The worship of ancestor is not unique of Africa, it characterises many other parts of the world, from the West to the East, however in these regions the introduction of Hinduism, Buddhism, Islam, Judaism and Christianity prevailed and old traditions were lost. This has not been the case for SSA. The desert and other natural barrier isolated SSA for centuries and local communities developed a coherent and well-established system of values, social rules and religious practices also called lineage-based system, that celebrates large families and high fertility due to its principal aim is to continue family heritage. As a result, while in developed societies large families and high fertility are considered endangering the economic development not only of the family but also of the whole economy of the community, in SSA large families and high fertility are economically and socially rewarded. Caldwell argues that this way of thinking is at the origin of the

obstacles fertility transition finds in SSA and this is also the step to overcome to reach sustainable development and better standard of living for all.

In SSA the fertility dynamics are the result of a fight between fertility constraint and compensative mechanisms. On the one hand, pre-marital fertility is discouraged; post-partum abstinence (after a birth women do not have sex for a period from few months to three years) and terminal female abstinence (when women become grandmothers they give up sex until death) are enhanced. On the other hand, there are some compensative behaviours: women marry very young; polygyny is common due to unbalanced sex-ratios; young widows remarry soon and young couples are stimulated to immediately have children after marriage.

In addition to this, in SSA there has been no attempt to promote low fertility or moderate family size; high level fertility is a cultural factor, not the result of old value erosion; and post birth abstinence is considered enough as a method of control and other contraceptive methods are not used.

Moreover there are other singular dynamics. Siblings are so evaluated that for older people the worst thing is to die without children. Innovative families which choose to have less children are considered irresponsible by the follower of the tradition. If all the children died the family is condemned to extinction, a risk that cannot be accepted. Premature bareness, pathological or wanted, is abhorred. It is not a surprise if the ideal size of the family is around six or eight children, and the rate of contraceptive use is a few points above ten.

At the base of this system there is the animist religion. In the traditional religion of Africa we can find a pyramid of three levels. In each one different gods influence fertility decisions in different ways. On top there are the higher gods, interested in the society only as a whole, eternal, with the role to protect ancestors. Then there are the spirits (of the river, of the mountains, of the water,...) which might be the spirits of deaths which did not become ancestors. Finally, closer to the human level, there are the ancestors, spirits who protect the family and influence events. For the animist religion the main evidence of a right behaviour is high crop productivity and high family fertility. Abundant human and crop reproduction is a reward for a behaviour in compliance with the divine order. Among high gods, spirits and ancestors, the ancestors are the most regarded by the living members of the family, the elderly in particular, since they will become ancestors shortly. Their course or disapproval are feared by young couple as causing barrenness or child death. This is an

unbearable price for the couple, since children are the economic resource of the family: traditionally the wealth flow passes from the young to the old in the family, so assuring old people survival. A family with no or few children has no economic future and is guilty for non-continuation of the lineage. Behaving against tradition means economic and social marginalization.

This type of religious structure has important consequences in all the aspects of a couple reproductive life. For example in SSA women, right after marriage, belong to the family of the husband: the man and his family decide the number of children. In addition polygyny is used. Therefore the link between man and woman, the only possibility for the woman to express her opinion and to influence the man's decisions, are reduced. "The fear of a wife who seeks to control her own reproduction is not in consequence of having broken a socially recognised contract but of angering her husband's ancestors, both living and dead, and thus causing suffering to herself and her children". Moreover the use of birth control methods, the idea of birth control, are considered sinful and barrenness, child death and sickness are forecasted for the couple which use them, as a sign of disapproval of ancestors. The only accepted method is abstinence (Caldwell and Caldwell 1987)

From this picture it is clear that the fertility transition meets so many obstacles in SSA. What is needed is a social change which assures a real change. Government action, information, education, ... should be widely used to reach this result.

Finally it is worth mentioning the work of Blunch (2011). Blunch recognises the importance of the Demographic Transition as a necessary step to reach a sustainable development and a better life quality for all the members in a community. For Blunch the dynamic of the change in fertility is clearly described by the expression "quantity quality trade off" of childbearing. His works focus on the use of contraception, considered the most important driver of fertility control. "Since many developing countries have not yet reached a decrease in fertility consistent with stable population growth – which in turn would enable (increased) economic growth and quality of life, including moving from "quantity" to "quality" in the quantity-quality trade-off, there is, thus, plenty of reason for examining what affects contraceptive use at the individual or household level" (Blunch 2011). He claims that what affects contraception are mainly education and religion: individuals belonging to animist religion are less likely to use contraceptive methods and to desire a small, modern, family. Animist traditional worship celebrates big families and traditional values, while other religions (in this case Islam and Christianity) promote "modern" and "western" values and life model and so are more likely to apply family control

plan and contraceptive use. In addition Blunch investigates if alternative educational types affect the level of contraception use, and if religion has greater influence on less educated people and lower influence on more educated ones. The results he obtains confirm that adult literacy has a strong impact on contraceptive use and the influence religion has on contraceptive methods is reduced by the increasing level in education. Therefore education is a powerful tool to start the change in the religious and social context.

1.6 Conclusions

The most important conclusions that this literature review suggests are the following:

First, the majority of scholar see a causal, negative relationship between education and fertility. Some claim the direction is from education to fertility, others from fertility to education, while a group believe there is a two-sided influence.

Second, education uses multiple channels to shape fertility behaviours: not only it gives information on sexual, reproductive and contraceptive methods, but also provides mothers with some literary formation, helping changing the status of the women and achieving higher control on their lives.

Third, education is effective on fertility trends only after some threshold level of educational input is passed, and this influence follows an inverse U-shaped trajectory.

Fourth, schooling effects on fertility are important not only at the household level, but also at the community level: education conveys new up-to-date values, and contributes to changing the lifestyle of a society.

Finally, the role of education on reproductive behaviour is not only a matter of historical interest. The demographic transition occurred long time ago in developed countries, but is a more recent, and sometimes current, reality in some developing societies. Therefore also now economists, demographers and historians are investigating on this to understand what will be the future fertility trends, especially in developing countries.

CHAPTER 2

Many LDCs still in the core of demographic transition are worth to be analysed. However we choose to focus on Sub-Saharan Africa countries because of the availability of data, the presence in SSA of a multiplicity of small states and the variety of their characteristics, which enables to do comparisons, to analyse the effects of some variables (religion, social norms, health services, education,...) and to better comprehend the role of these variables.

Due to the aim of our analysis is to investigate the nature of the link between education and fertility from the point of view of the single household, we will not look at SSA in general but we will focus on three countries in particular: Ghana, Niger and Senegal.

This choice is driven by the type of relationship fertility-life expectancy they present. As we said SSA passed from a fertility rate of 6 children per woman to one of 3 in almost 30 years in some parts and in others is still at 6-7 children per woman (World Bank). At the same time life expectancy is well below the western standards. DT is still in process in some countries of SSA and the timing of DT differs from country to country. In 1998 Kirk and Pillet divided the countries of Sub-Saharan Africa in three groups regarding their fertility rate's trends. In the group of nations more advance in DT we find countries such as Zimbabwe, Botswana, Kenia, Namibia, Lesotho and Ghana. Then follows the middle group (Zambia, Cameroon, Senegal, Nigeria, Rwanda and Madagascar) and the less advanced group (Togo, Burkina, Niger, Uganda, Burundi, Liberia, Malawi and Mali) (Garenne and Joseph, 2002). From each of the three groups we have selected one country for the analysis: Ghana from the first, Senegal from the second and Niger from the third. These countries have common characteristics which will make easier to perform comparisons about the trend in fertility and the variables which affect it, but also some peculiar aspects, useful to find out particular dynamics. These type of information are listed in the following short presentation of the three countries.

Imagine 2.1: Birth per women, 1960-2012, Ghana, Senegal and Niger



Source World Bank

2.1. Ghana

2.1.1. Geography

Ghana is one of the state of SSA on the Gulf of Guinea, whose coastline extends for 560 Km. It is an English-speaking country bordered by French-speaking ones: from the West to the East, Cote d' Ivoire, Burkina Faso and Togo. Ghana is a lowland country rich of water. The three principal ecological zone are the sandy coastline in the South, were is very difficult to have some harbours; the central plain crossed by the River Volta and Lake Volta, one of the biggest artificial basin in the world; and the savannah in the North. The climate in the South is wet with almost 2000mm of rain in a year. There is a short rainy season in September-October and a long one in March-July. Temperature are quite high with 29°C in January and 25°C in July. In the North the climate is drier, with one rainy season only ()

2.1.2 History

The history of ancient and modern Ghana is related with commercial exchanges. In the XII-XIX centuries the Ashanti Kingdom became rich and powerful thanks to the control on

the market of slaves and gold. In 1874, after several years of contrasts between the colonial powers, Ghana became a colony of the United Kingdom, famous for its gold. It was called Gold Coast. During the decolonisation period, in 1957, Ghana was the first of the colonies of SSA to become independent. Since then periods of democracy alternates with periods of military power. Right after the independence Ghana became a republic under the president Kwame Nkrumah, the leader of the CPP (Convention People's Party) who guided the fight for independence. In 1966 a coup assured the army the control of the country until 1969. Then, for few years, survived a second republic. However in 1972 military came back to power and ruled Ghana for 7 years. In 1981 Jerry Rawlings suspended the constitution and established a govern of military and civilians, that lasted until 2000. Rawlings introduced some changes toward democracy: in 1992 a new republic was born and a new constitution was written. From 1995 many social and regional conflicts arise, however the successor of Rawlings, J.A. Kufour, managed to keep some political stability. In 2009, after two mandates of Kufour, J.A. Mills was elected legitimately, and the nation gains the title of stable democracy. Recently important progresses were made, such that nowadays Ghana is one of the most developed countries in SSA(en.wikipedia.org).

2.1.3 Economy

The economy of Ghana is widely based on the cultivation of cocoa, on forestry, gold mining and oil trade.

The growth of GDP in Ghana in 2011 was mainly driven by the industrial sector, which recorded a growth rate of 36.2%, with the mining and quarrying sectors performing particularly well.

Service sector too contributes to the growth. This sector grew by 4,2% during 2011. The main drivers of the growth were: activities related to community, personal and social services (12%), information and communication sector (10.5%), public administration (7.3%), transport (7.1%), health and social sector (6.1%). As regard agriculture, the sector grew less than what expected in 2011, but records very good performances in the crops (cocoa), livestock and fishing sub-sectors. Currently there is an trade deficit (8%) due to some investments activities in the leading fields, however exports are good and are based on cocoa, gold and oil. The country has also been able to maintain a one digit inflation rate for 19 months, the first time after 30 years. In the last years the Ghanaian economy generally performed well and the World Bank even ranked the country among the top ten

global performers in the 'Doing Business' report. However there are some obstacles that Ghana still needs to overcome to reach effective modernisation, among these a weak system of infrastructures, a financial system which is not fully developed, inadequate managerial and technical capacities and a problematic public administration(www.africaneconomicoutlook.org).

2.1.4 Population

Ghana is populated by many different ethnic groups: Akan(52%), Male-dagbani(16%), Ewe(12%), Ga-adagame (8%), Gourma (3%), Yoruba (1%) and others (8%). English, Kwa languages and Gur ones are the most important languages. The religious world is multifaceted too. The North is mainly Muslim, the south, because of the influence of previous religious missions, features a high number of Christians while many villages in the country appear to be deeply linked to the Animist religion.

2.1.5 Social Context

The good performance of Ghana's economy in the last years helps this country to improve different sectors. First of all in the health care sector Ghana promoted some projects to lower under-five mortality and maternal mortality, to increase the access of women to health care, and to prevent pre-natal problems. Under-five mortality was reduced from 111 dead children over 1000 to 80 over 1000 birth with living children in the period 2003-2008. Maternal mortality passed from 740 dead women to 350 dead women over 100000 live births. Despite this good result Ghana is not going to meet the MDGs of 2015 in these fields.

Government's efforts target also education, with grants, free books, food programs, and free uniforms. As a result the net enrolment rate increases, but many issues still wait to be solved: the quality gap between urban and rural school service and the completion problems for examples.

Finally despite the good economic performance of these years Ghana suffers of regional imbalances, with a deep poverty gap between North and South. Many programs, such as the Private Sector Development Program (PSDII) , the National Employment Policy (NEP) and the National Social Protection Strategy (NSPS), are implemented to enhance development in the northern poorer regions. The 5,5% of government expenditures are for pro-poor activities to support poor and vulnerable groups.

2.2 Niger

2.2.1 Geography

Niger occupies a very singular position in SSA , it is at the border between SSA and Maghreb. The territory is divided principally into two regions: in the North, where there is the desert, the Harmattan blows, temperatures are high during the day and low during the night, except for oasis there is no vegetation; in the South the presence of the River Niger lets the savannah and the tropical dry forest to grow around it, concentrating most of the human activities here ().

2.1.2 History

The history of Niger begins many centuries ago with rich empires that flourished on the commerce of gold, salt and slaves. At the beginning of the 19th century Niger became part of the French colonial empire and gained the independence only in 1960. Between 1960 and 1974 a West-friendly government began a period of transition with the aim of a democracy. However some problems arose for famine and ambiguous management of international aids. Therefore in 1974 a putsch suspended the constitution and established the dictatorship of Seyni Kountché. In 1987, after the death of Kountché, the Supreme Military Council guided the nation for four years. After some rebellions of the Tuareg, a group of the desert, in 1991 a civilian government began. Unfortunately 1996, for some internal clashes, the dictatorship took over again for three years. In 1999 a democracy government was established in the form of a presidential republic, where the president and the members of the government were elected with a direct system every five years. However it had great difficulties with the problematic socio-economic situation and the increasing number of clashes. In 2009 the two time president Mamadou Tandja dissolved the parliament to maintain the power after the five-years period. In 2010 military forces take over and a Council for the Restoration of Democracy was established. This Council worked as promised and the political setting was normalised, a new constitution, new elections and a new president were elected. Nowadays the democracy of Niger need to work hard to put the basis for security, peace and development: everyday civil rights are violated, capital punishment is in force.

2.1.3 Economy

The growth rate of GDP of Niger passed from 8% in 2010 to 4,2% in 2011 due to some external shocks, such as bad weather, dryness, but also the crisis in Cote d'Ivoire, Libia and Nigeria, the neighbouring countries.

The deadline for developing countries to satisfy the Millennium Development Goals is near (2015) but Niger is not likely to respect them. Poverty strongly affects living condition of the population, and all the efforts made until now show little results.

Unemployment among people searching a job for the first time is around 40%. The economy is underproducing, there are no foreign investments, and labor force increases due to immigration from the nearby countries.

Agricultural sector contributes for the 42,3% of the GDP- However the crisis of the cereal production (692 000 tonnes less than 2010) due to bad weather condition generates very bad performances.

The manufacturing sector's performance is controversial. From one end promising projects of oil refinery and uranium extraction in collaboration with France and other western countries bode well, however the manufacturing , construction and energy sub-sectors perform poorly. Moreover in 2012 the World Bank listed Niger at the 173rd over 183rd countries in the Doing Business report. The main obstacles for the business sector are corruption, weak institutions, scarce access to credit, contradictory rules and complex registering property systems. The government needs to improve the situation to stimulate the private sector. This is the aim of the Strategic Framework for Growth and Poverty Reduction, a project to boost regional and international trade participation, microeconomic environment and institutional support to the private sector.

The service sector, performs better: the return to a more stable democracy positively affected the education and healthcare systems. The trade balance is currently in deficit (-14,8) however the opening of the oil refinery and the uranium company promises better results in the future (www.africaneconomicoutlook.org).

2.1.4 Population

The 90% of the population is Muslim, very few people are Christians or follow the traditional indigenous religion beliefs. The population is divided into different ethnic groups: the Haussa live near the border with Nigeria, in the Sahel, and they control the economic power; in the South -West there are the Djerma-Sonngai (20% of the population) which have the political power; the Peul (11% of the population) live in the Sahel region; then in the desert there are the Tuareg, a nomad group. Finally the main languages are French and Haussa, plus some others used by different tribes.

2.1.5 Social Context

Niger has to work a lot to assure its people decorous living conditions. The health system is improving: the government promoted a new health development plan for the years 2011-2015; the country is in line with the MDGs as regard HIV/AIDS and mother pre-natal health care rose thanks to a free consultations program.

The education system is inadequate (gender inequalities, geographical disparities, scarce management of the resources,...), and improvements are needed due to the enrolment rate is increasing in primary school. In 2003 started a project to improve the access to schooling, improve the courses and ameliorate the institutions. As a result the net enrolment rate passes from 25,4% in 1997/1998 to 62,8% in 2009/2010, while the gross enrolment rate passes from 32,4% to 67,8% in the period 1999-2009.

Changes need to be done also for a better and more equitable society. Women are often discriminated, they have less access to school, work and political power, 53% of the female in the work force has no job, 97% of women work in the informal sector and fight for subsistence. High population growth (7% fertility rate) hinders the development of the economy. The 60% of the population has less than one dollar a day. Only 42% of the population can use clear water. Niger is the 186th nation over 187th in the UN Human Development Index. (Africa Economic Outlook, 2012)

2.3 Senegal

2.3.1 Geography

Senegal is situated in the Western part of SSA. It has 500km of coasts, plain lands and two rivers, the River Senegal in the North, the River Casamance in the South, which constitute the border with, respectively, Mauritania and Guinea/Guinea Bissau. The climate changes from the North to the South. The Northern region is characterised by high temperatures, little rain and the Harmattan blowing in winter and spring. In this part of Senegal agriculture and farming are possible only near the river. Along the coast temperatures are around 21°C in January and 27°C in July, with a raining season in June. In the South rains reach the 1000mm per year, and the typical landscape is made of savannah, baobab, acacias and sparse forest. Finally the region of Casamance reaches the 1500-2000 mm of rain per year, has a rich tropical flora and different types of cultivation are possible ().

2.3.2 History

Senegal has been the object of European colonialism expansion since the XV sec., especially for the slaves trade. Portuguese, Dutch, French and British arrived in Senegal

but in the end it became a French colony. French carried out a deep political and cultural assimilation in this region. Only in 1960 Senegal became independent, and L.S.Senghor became the first president. In 1962 the leader transformed the country in a socialist republic with one party. This situation lasted until 1968, when the multiparty system was restored. Abdou Diouf from the socialist party succeeded Senghor in 1981 and was re-elected also in 1988 and 1993. In 2000, for the first time since 1960, an exponent of the Senegalese Democratic Party, Abdoulaye Wade, became president. He is responsible for the peace with the separatist forces in Casamance (2004). Wade was re-elected and in 2011 tried to overcome the limits of two presidential terms imposed by the constitution for the 2012 presidential elections. In 2011 instability arose also for demonstrations against high prices, for power cuts, against the new problems with the Movement of Democratic Forces of Casamance (MFDC) in Casamance, and for the strikes in the transport, oil, gas and education sectors. The victory of the leader of the opposition Macky Sall, during the election of the 17th June 2012, that was accepted by Wade, is expected to introduce some improvements.

2.1.3.3 Economy

The growth rate of GDP in Senegal in 2011 has been 4%. Under the assumption that the government will implement the ISPE-II Economic Support Policy Instrument, the growth rate of the economy is expected to be 4.2% in 2012 and 4.7% in 2013. This program aims at the development of the energy and road sector, two key elements to enhance the performance of productive sectors.

The three main economic sectors, that is primary, secondary and service sector, contribute respectively 17,4%, 21% and 60% to the GDP of Senegal. Primary sector comprehend agriculture(8,2%) and livestock and hunting(4,22%). Secondary sector deal with constructions(4%), meat processing and fish processing (3%). Tertiary sector grows 3,8% in 2011 thanks to the performances in sub-sectors such as transport, commerce, communication and posts. The reactivation of the Senegal Airlines is expected to help the tertiary growth to reach the 4,3% in 2012. As regards the trade balance Senegal has a deep deficit, due to in 2011 exports were 16,8% of GDP and import 34,7%. These growth rates show that it will be difficult for Senegal to reach the status of emergent country in few years as it hopes: in the Doing Business report of World Bank for 2011 Senegal occupies the 154th place, closer to Niger than to Ghana, but better than the 157th place of 2010 (www.africaneconomicoutlook.org). Efforts have been consistent:

- the Presidential Investment Council (CPI) and the State Investment Agency (APIX) promoted programs of modernisation, competitiveness and expansion.
- the Takkal plan, in 2011, helped the energy sector to improve its performance through the retrieval of some power station and the upgrade of the transport system and the networks for the distribution of electricity.
- in general the government is trying to make easier the processes to start a business or to invest in some activity.

2.1.3.4 Population

The 88% of Senegal population is Muslim, a small 5%, especially in Casamance, is Christian and 6% follows the traditional Animist worship. Different ethnic groups live in Senegal. The 43% of the population is Wolof, and this is the biggest group. Wolof live in the centre of Senegal, practice agriculture as the main activity, and take part in the administration of the country. Serer, the 15%, are a group of farmer affine to the Wolof. The Peul (14%) and the Toucouleur (9%) live in the northern part, where the desert makes human activities very difficult to perform, they are nomad and live of farming. The ethnic groups of Casamance are the Idiola (5%) and the Mandingo (4%). This type of ethnic structure influences also the spoken languages. The official one is French, but only the 20 % of the population use it. The most important language instead is the Wolof, plus many other regional dialect.

2.1.3.5 Social Context

Senegal is putting great effort in the health and education sector. In 2011 about 18.5% of public spending was devoted to education and 5% to health. Therefore the under five death rate passes from 121 dead children per 1000 children in 2005 to 72 dead children per 1000 in 2011; the percentage of clinic birth rises from the 62% to 73% in the period 2005 - 2011; contraceptive methods are used by 12% of the population on average, with an higher percentage (21%) in urban areas and a lower one (6.5%) in rural areas; finally consistent progress occur in the fight against HIV/AIDS, tuberculosis and malaria.

Gross enrolment rate of education increases sharply from 2009 (92,5%) to 2010(94,4%). However what is the main issue with education is the completion rate: for primary school the rate in 2009 (59,6%) was higher than in 2010 (59,1%). A child who started school in 2010 in Senegal has a 58% probability to finish primary school, a 32% probability of

finishing the secondary school and a 21% chance to start the last year of upper secondary high school.

Senegal in 2011 assigned the 49% of investment resources to regional development and basic infrastructure, the 29% to the social sector and the 9% for the modernisation and development of farming and agriculture sector. Between 2007 and 2009 education expenditure were the 23.8% of the total public spending. However these efforts were reduced by regional inequalities. The highest part of health spending went to the richest part of Senegal (Dakar, Saint-Luis), while the poorest part (Louga, Tambacounda and Ziguinchor) got less. The same is for education, where inequalities are registered among richest and poorest regions as regard the allocation of resources. "In the regions of Kolda, Louga and Tambacounda, schools not offering a full curriculum represent respectively 71,2%, 77,8% et 85,3% of the total number of primary schools, compared with 13,5% in the Dakar region"(African Economic Outlook, Senegal, 2012)

Also social protection area is concerned with some inadequacies: the social protection system is available only for about 20% of the population; only 16,6% of retired people receive a pension, only the 13,3% of children between 0-15 years get family allowance,... To handle these difficult situations many national and international programs have been implemented: allowances for vulnerable households, cash transfer programs, "child-targeted nutrition and social transfer programme (NETS)", grants to the orphans and to deprived children exposed to AIDS risks. However reforms in the social protection system, higher protection coverage and better management of risks and disasters are still needed.

CHAPTER 3

3.1 Data

The analysis will be done using the DHS (Demographic Health Survey) data. This survey contains information about population, health status and nutritional trends of a large

number of households (from 5,000 to 30,000) of each single country in the region of interest. Even if the focus of this type of survey is health, it is also useful to get complete information on education and population variables. These areas are key background aspects to be known to better understand health conditions in a country. Of course, we will focus on the section of the database that gives the most interesting information for our investigation.

Data for Ghana belong to the DHS 2008, data for Senegal came from the DHS 2010-2011, and data for Niger are part of the DHS 2006. They are the result of the effort of different organisations. For Ghana the GSS and the GHS realised the survey, and ICF Macro gave technical support. The United States Agency for International Development (USAID), the government of Ghana, UNICEF and other organisations gave founding for the survey. The work has been done in the period 8 September 2008 - 25 November 2008. The representative sample of household counts 12,323 families. Individuals belonging to some of these were also selected for individual surveys: 5,096 women between 15 and 49 years old and 4,568 men between 15 and 59 years old. Household response has been 99%, women's one 97% and men's 98% ([Ghana 2008 DHS Final Report](#)).

In Senegal data were collected in 2010-2011 and organisation such as ASND (SIGLA), ICF Macro, "Le Centre du Reserce puor le Development Human" (CRDH) took part in the performing and funding of the DHS. The households selected for the interview are 8212 with a response rate of 98,4%. Among the individuals belonging to the households, 16931 women between 15 and 49 years old and 5668 men between 15 and 59 years old were selected for the individual survey. The response rate is 92,7% for women and 87,0% for men ([Senegal 2010-11 DHS Final Report](#)).

For Niger it is the same. The survey has been realised thanks to the contribution of the Institute National de Statistique, the DHS American Society, the Centre du Reserce Médicale e Sanitarie (CERNES). UNICEF, USAID, the Fonds de Nations Unies pour l'Enfance (UNFPA) and the Programme de Nations Unies pour le Development (PNUD), the World Bank, and others provided the funding. 8419 households were selected for the representative sample of the survey (97,9% response rate). As for Ghana and Senegal among the members of these families 15-49 years old women and 15-59 years old men were chosen for the individual survey: 9646 women (95,6% response rate) and 4210 men (98,0% response rate) ([Niger 2006 DHS Final Report](#)).

Sampling follows this process: households are sampled in a sample interview group on a regional base to get as much as possible representative data of all the regions of the country and of the urban and rural area. Then, using national census, researchers grouped the families in the sample interview group in clusters. For each cluster 30 households were selected with a systematic sampling. At this stage of the sampling process, families' members were evaluated to see whether they were eligible for the Individual Survey. This sampling process is useful to count for regional and rural/urban differences and, also, to create samples with an adequate number of eligible women and men for the Individual Survey.

3.2 Questionnaires

In all the countries where DHS has been performed objects and methods were quite the same. Questionnaires have been used to collect data in all the countries, with some regional variation to adapt the survey to the environment. The Household Questionnaire, the Individual Women Questionnaire and the Individual Men Questionnaire are the principal tools.

The Household Questionnaire is the more general one and includes information about the members of the family and also about people visiting the family who sleep the night before the interview in the family's house. This type of questionnaire collects personal information, education data, social status and wealth level information. To understand the environment and social framework of the family house's characteristics, data on the use of nets against malaria or iodised salt use, information about land ownership and home security have been collected. Moreover, the health status of adult and children receives great attention. Information about malaria, HIV, haemoglobin test, parasitaemia test and anthropometric measures have been grouped to define the health status of adult and children.

The Individual Women Questionnaire is the most important and is divided in 10 parts:

- Socio-demographic characteristics: in this sector general personal information, the region of residence, the religion and the ethnic group, the educational level, the literacy rate, the exposure to the different types of media and other info are collected.
- Fertility: data collected in this section are key elements for this work, since they enable to construct, for each women in the sample, her reproduction story (date of marriage, date of first births, birth intervals,...).

- Use of contraceptive methods: in SSA the use of contraceptive methods is low and there are many reasons why women do not use contraception. Because they do not want, because they do not know it or because they do not have access to contraception methods. This section is useful to collect data to better comprehend contraception dynamics and diffusion.
- Pregnancy, breastfeeding, child health: this part is important to get all the data we need about childbearing.
- Marital status and sexual activity: this group of data enables to define when women began to be involved in reproduction decision making. The year of first marriage is therefore the moment where we start to register the fertility history of the women.
- Reproduction preferences: women are asked which are their preferences in terms of family size, ideal number of children, ideal number of boys/girls,...
- Other health related issues.

The Individual Man Questionnaires is close to the Individual Women one, even if shorter. There are seven main sections: socio-demographic features, fertility, contraceptive use methods, marriage, sexual activity, family size preferences, employment and role of women/men in the family.

3.3 The model

The aim of this work is to investigate, from a micro point of view, the existence of a relationship between education and fertility's decisions, and its type if it exists. However, in addition to education, it is interesting to enlarge the investigation to other cultural and social variables such as religion or media exposure. The dependent variables of our model are the age at first birth, the age at last birth and the conception interval. The first two variables correspond to the starting and stopping of the reproductive history of the woman, while the latter describe the spacing among the conceptions. We will analyse the start and the stopping with the common Linear Regression, while the spacing will be the object of a Cox Regression. The independent variables of the model can be grouped into some categories: education (education in single years and literacy), religion, ethnicity, media exposure (frequency of watching television), residence, marital status, age, demography (number of children, ideal number of children, parity, net parity, children birth's vitality,...) health status of the mother (presence of amenorrhea, n° of caesarean section) and wealth

(wealth index). Some control variables should also be included: husband mobility, relationship with the household head, sex of the household head, mobility of the family, polygyny, frequency of sexual intercourse, use of contraceptive methods,...which we supposed to influence the framework in which the individuals take their fertility decisions.

Dependent variables were chosen to be effective indicator of the fertility behaviour of the households. A couple which desires a high number of children should have a smaller age at first birth, while a couple with a lower ideal family size will wait for the first child.

Moreover, longer conception intervals means a stronger family planning program, where the family size is controlled by distancing births along the fertility period of the woman.

Independent variables were chosen due to their predicted influence on the dependent variables.

Education is a key element for fertility decisions, and can act directly or indirectly: educated women are able to access and to process more information when taking a decision, are more independent in their everyday choices and so should have more power in the family, with a smaller gender gap (Basu, 2002). Moreover, education changes the attitudes of individuals towards social rules, values, and religion traditions. Education stimulates people with new information, values, models, incentives,... and so it lowers the weight of tradition in the decision making process (Caldwell, 1980). In the DHS surveys, data on education are given mainly by three variables. "Higher education level" divides respondents' education in "no education", "primary", "secondary", "higher" and so gives the higher level of education attainment of the individuals. "Highest year of education" counts the years a person studied. Information are also given on the literacy rate distinguishing among able or not to read.

Religion is also a variable that can influence fertility's decisions. As we have seen in chapter one in SSA countries the power of religion and community and the values they defend is strong, and influences everyday life of people. From the first chapter we should remember the patriarchal structure of households and the family based economic system which are common in SSA, in addition to the presence of animist worship and traditions (Caldwell, 1980).

Access to media has also to be considered due to the external stimulus media convey. From one side media give information about the Western World and its lifestyles and values (small sized families, independence, consumption,...). On the other side, media are

the main tools to be used to spread information about contraceptive use and to increase its demand.

The region of residence is also important for fertility choices: rural lifestyle is different from urban one. Of course, this division should be taken into consideration due to rural households are more exposed to community rules and dynamics, while in the city people are exposed to media, television and other stimuli every day.

Demographic variables are necessary since they set the conditions determining a family's decision about fertility. A couple will plan a pregnancy if few or no children survive birth or live only few months; the death of a child makes the mother weaker and so it lowers the probability of another pregnancy, but also raises the desire for another birth. A family which has already reached the desired number of children, will try to lower the possibilities of another pregnancy; the period of post-partum abstinence, which varies from few months to three years, plays a role in the conception interval pattern.

Finally, regarding the independent variables, the model can be completed introducing the wealth level of the households. This is not a cultural variable, but strongly economic one, however it is expected to influence fertility decisions. A child can be an important economic resource in a family based system, but once the education service is available and families are stimulated to educate children, he begins to be an additional cost, in economic terms of course, and cannot be used as a resource any longer (Caldwell, 1980).

Moreover, the presence of some control variables should be explained. Control variables are necessary for a better fitting of the model. We suppose the following ones are important for our analysis:

- the relationship with the household heads. Often young spouses are totally under the control of the husband's family, which is the one deciding the time of first birth and the successive conception intervals of the couple;
- polygyny is a practice that weakens the relationship between husband and wife and so the possibility for the women to strengthen her position;
- the mobility of the family, but especially of the husband, which influences the frequencies of sexual intercourses;

- the use of contraceptive methods, which of course strongly affect the possibility of a pregnancy.

This is the completed version of the model we decide to use, however we tested also reduced version to focus on the variables that are more important, with different specifications.

3.4 Descriptive Analysis

Before using econometrics tools we analyse some tables where education and fertility variables are represented for each country, to look for unique patterns, similarity and differences, before using the econometric tools. Data concern the women belonging to the household interviews in the three countries.

Table 3.1 shows the distribution of respondents across age, education, literacy, religion, place of residence, access to media and wealth index. Ghana confirms his profile of leading country in SSA: the highest percentage of the women (41.10%) attain secondary school level, only the 34.16% is not educated and the 22.15% of the women have primary education. The situation is different in Niger and Senegal. In the former, the 86.31% of the women did not go to school, while in Senegal not educated people are the 80.84%. The gap between the secondary high school percentage in Ghana and Niger is 37,18%, while in Ghana and Senegal is 36,72%.

This huge difference in the educational variable between Ghana and the other two countries interests also the literacy variable: in Ghana the percentage of people unable to read is 67.15%, while in Niger is 89,94% and in Senegal is 80.84%.

Some differences between the three countries are found also in religion. Ghana is a Christian country, while in Senegal and Niger Islam is the most widespread faith. Notably the percentage of animist in Ghana, close to 7% of the sample, while in Niger and Senegal it does not reach 1%. These differences will influence the way individuals look at reproduction activity and choices, as we have explained in the first chapter (Caldwell, 1987).

Data for residence are quite the same in all the countries, a percentage between the 30% - 40% of the women lives in urban environment, while the remaining in the rural one.

Therefore a huge part of the population is far from the services, stimuli and opportunities of towns.

Something similar happens also with the access to media: about half of the population in Ghana and Senegal, and more than the 80% of the population in Niger, does not watch television at all. In Niger only the 10% of the people watch it every day, while none in Senegal. As a result access to media is an exception, not a constant, in everyday life.

Access to media is therefore a meaningful variable in our analysis.

Table 3.1 Population distribution among the main socio-cultural variables

	GHANA	NIGER	SENEGAL
AGE GROUP			
15-19	3.23	1.80	1.93
20-24	13.44	7.96	8.93
25-29	19.68	16.51	15.82
30-34	17.92	18.20	18.89
35-39	18.49	21.26	21.25
40-44	14.38	19.16	18.58
45-49	12.86	15.11	14.59
EDUCATION LEVEL			
no education	34.16	86.31	80.84
primary	22.15	9.54	14.93
secondary	41.10	3.92	4.38
higher	2.59	0.23	0.22
LITERACY			
cannot read	67.15	89.94	82.80
can read	32.85	10.06	17.20
RELIGION			
missing	7.46	0.00	0.02
chatholic	20.57	-	
pentecostal	33.27	-	
other christian	10.05	0.54	3.14
moslem	17.25	98.52	95.95
spiritualist	6.86	0.03	0.86
no religion	4.54	0.44	0.04

	GHANA	NIGER	SENEGAL
RESIDENCE			
urban	38.97	28.29	29.76
rural	68.03	71.21	70.24
MEDIA (TV)			
not at all	48.51	82.87	43.40
less once a week	8.53	3.43	16.97
more once a week	17.25	3.67	39.63
every day	25.53	9.78	-
WEALTH INDEX			
poorest	25.20	19.10	31.18
poorer	20.84	16.61	26.32
middle	18.77	16.88	21.09
richer	19.50	19.67	13.47
richest	15.69	27.74	7.94

SOURCE: DHS Survey

Moreover it is useful to look also at the distribution of education level across groups of different age, religion, and so on, in the countries we are studying.

Looking at the distribution of the highest education level among the five years age group (table 3.1) in Ghana the level of education attained by women has increased in the last decades. The percentage of not educated women among the youngest is less than half of the percentage of illiterate women among the oldest. Another trend we can observe is that for the middle age groups the highest percentage of women have the secondary education. On the contrary, for the 15-19 age group the primary and secondary level percentages are almost the same. Probably in recent years the access to education became broader and less related to wealth status or gender gap, therefore, for this age group the percentage of not educated girls goes down in favour of the primary level, whose percentage gets closer to the secondary level's one. In previous decades, only a minority of the women had access to education, thus population was divided into two groups: the poorest one, which could not afford education, and the richest one, which could afford not only primary but also secondary education level. In this case the percentage pattern passes from the high values of the non educated and secondary level group to the low values for the primary level one. The same dynamic is not recognisable

for Senegal or Niger. In Senegal the 63.18% of the women between 15-19 years have no education, a little gain compared with the 84,46% of non-educated women between 45 and 49 years. In Niger the improvement is almost non-existent. Among younger women the percentage of not educated girls is 83,50%, very closed to the 89.80% of the women between 45 and 49 years.

The distribution of education across religion (table 4.2) reflects the dynamics related to each worship. Looking at within-group percentages in Ghana Christians and Muslims have an opposite pattern: 50% of muslim women are not educated and 20% completed the primary and secondary level each; while 50% of christian women are well educated and 20% receive no education or only at a primary level. Animist women are mostly uneducated. For this reason in Ghana religion contributes to create huge differences in education among the population. Moreover the high percentages of Christians may be an explanation of the better education level of the country in general (table1). In Senegal even if the percentage of not educated christian women is well below the one for muslims or animist, the majority of the sample in each religion group concentrate in the not educated column. In Niger there is not such a framework and the distribution of the highest education level across religion shows no differences among Muslims, Christians or animist: uneducated women are around 80% for all the faiths, a percentage between 10% and 15% reaches the primary level and less than 10% the secondary. Religion is not an explicative variable for education.

The relation education-wealth follows similar pattern in the three countries, but with different timing and size. Precisely in Ghana it happens what many authors claims in their works (...): the poorest individual are the most illiterate, 70% of the women in the lowest wealth quantile have no education, only 19.13% reach the primary level and only 9,9% the secondary, no woman continues to the highest level. This trend begins to change with the poorer and middle wealth group and effectively changes with the richer one. Here the majority of the women are well educated (secondary level), the 22.29% has primary education and only the 15.02% has no education. Finally the percentages of the richest group tell exactly the story we expect to hear: 7.92% “no educated”, 13.71 “primary”, 66.00 “secondary” and 11.78% for “higher” levels of education, an incredibly high percentage in relation to the other wealth groups. Senegal presents a similar situation with different magnitude. Among the poorest, the 90% of the women are non-educated and less than 10% arrive to the primary level. For the poorer, the percentage of non-educated women is

	NO EDUCATION			PRIMARY			SECONDARY			HIGHER		
	GHANA	SENEGAL	NIGER	GHANA	SENEGAL	NIGER	GHANA	SENEGAL	NIGER	GHANA	SENEGAL	NIGER
	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL	AL
Muslim	56.26	74.53	82.89	21.69	18.28	11.02	20.46	6.81	5.70	1.59	0.37	0.39
Christ	22.91	45.38	75.56	22.57	30.16	15.56	51.36	22.55	8.89	3.15	1.90	0.00
Animist	78.76	88.46	100.00	15.49	10.26	0.00	5.31	1.28	0.00	0.44	0.00	0.00
Other religion	-	-	-	-	-	-	-	-	-	-	-	-
No religion	56.67	100.00	95.00	27.33	0.00	5.00	16.00	0.00	0.00	0.00	0.00	0.00
TOT	34.07	73.63	82.96		18.63	10.98		7.31	5.68		0.42	0.39
RESIDENCE												
urban	17.68	52.88	61.68	20.19	30.98	20.29	56.99	14.98	16.65	4.97	1.16	1.28
rural	44.46	84.33	92.26	23.42	12.27	6.86	31.08	3.36	0.88	1.04	0.04	0.00
TOT	34.07	73.63	82.96	22.16	18.63	10.98	41.19	7.31	5.68	2.58	0.42	0.39
Wealth index												
poorest	70.89	89.84	95.03	19.13	8.64	4.73	9.99	1.51	0.23	0.00	0.00	0.00
poorer	36.06	82.89	93.90	28.61	13.24	5.50	35.33	3.87	0.60	0.00	0.00	0.00
middle	24.23	68.53	92.08	26.01	23.12	6.64	48.79	8.17	1.28	0.97	0.17	0.00
richer	15.02	57.66	89.45	22.29	29.76	8.94	59.91	12.16	1.61	2.79	0.42	0.00
richest	7.92	42.87	60.46	13.71	32.13	21.43	66.60	21.93	16.81	11.78	3.07	1.30
TOT	34.07	73.63	83.96	22.16	18.63	10.98	41.19	7.31	5.68	2.58	0.42	0.39

Source DHS Survey.

To conclude this part of descriptive analysis we will have a look at the demographic measures that are more relevant in our study. With no surprise, we notice that, as for education, Ghana behaves differently from Senegal and Niger, closer to a developed country than to a developing one. For sure, this is the result of a demographic transition that is almost over, in addition to many other factors (education, religion, culture ...)

Hereafter some core facts, resulting from the observation of table 3.3, are listed.

–The majority of the households in Ghana (80%) have up to 5 children, while in Niger have up to 10 children. Senegal is in the middle with the 50% of the families in the first group and the 47% in the second.

–In Niger the percentage of households who experience child death, at least one, is the highest (65%); Senegal follows with 46%, and then comes Ghana with 29%.

–The share women that use some contraceptive method is incredibly high for Ghana, 22%, a percentage well above the average 12% of SSA. Niger and Senegal stay under the 15%. It may be that in Ghana, where education is widespread enough, households receive the right stimuli, and once they have made their choice, they are able to read contraceptive instructions and to use them effectively.

–Ghana, Senegal and Niger diverge also in terms of fertility preferences. In Ghana 50% of the women have declared they do not want more children, followed by the 39% who want another child. Senegal's preferences upset this equilibrium, with the 55% of the women desiring another child and the 37% of them longing for no more children. The situation of Niger is extreme. The 71% of the households want more children, while only the 20% desire no more.

–Finally, the ideal number of children for the majority of women is between 0 and 5 for Ghana, while it is between 6 and 10 for the other two countries. To notice the very small percentage of Niger for the interval 0 - 5: only 9% of the potential mothers has an ideal number of children in this group.

The analysis of the demographic variable confirm the conclusion we stated before: Ghana is one step ahead, followed by Senegal and then Niger in the struggle for development.

Table 3.3 Population distribution across the main demographic variables

	GHANA	SENEGAL	NIGER
N° OF CHILDREN BORN			
1 - 5	80.41	49.52	37.69
6 - 10	18.91	46.67	52.73
> 10	0.67	3.9	9.58
N° OF DEAD CHILDREN			
0	70.78	54.25	34.74
1	20.60	24.08	24.16
2	5.42	11.82	16.75
3	2.32	5.55	11.23
4	0.55	2.58	6.20
5	0.21	1.06	3.35
6	0.06	0.36	1.83
7	0.06	0.13	0.94
8	-	0.08	0.44
9	-	0.03	0.20
10	-	0.05	0.12
14	-	-	0.05
CONTRACEPTIVE USE			
yes	21.72	12.48	14.35
no	78.28	87.52	85.65
FERTILITY PREFERENCES			
another one	38.78	55.08	70.69
undecided	5.44	2.86	2.25
no more	50.80	37.40	20.11
sterilized	2.09	0.45	0.39
infecund	2.61	4.21	6.14
missing	0.28	-	0.42
IDEAL NUMBER OF CHILDREN			
0 - 5	60.77	33.79	9.26
6 - 10	33.81	38.63	52.03
11 - 15	2.12	2.34	21.16
> 15	0.53	0.27	1.25

Source DHS Survey

3.5 Multivariate Analysis

Given the high number of information and the structure of the data contained in the DHS Surveys we decide to base our work on the event history analysis. The event history analysis is very common in demography, because defines the entire reproductive history (date of first birth, dates of successive births, conception interval, child death, abstinence, amenorrhea, sterilisation,...) for each woman and studies the role of different variables on the events that characterised this history, principally conceptions (Tsuya et all, 2010).

The event history analysis can be continuous, if detailed information, such as the date, of the events are known, or discrete, if we know only the time interval when the event occurs. In each case we have to use a different regression model. DHS data give enough information to use a Cox hazard model with continuous time.

The model has the following general form:

$$h_i(t) = h_0(t)\exp(\beta'x)$$

where $h_i(t)$ is the hazard rate for the i^{th} individual, $h_0(t)$ is the baseline hazard (the hazard function for individuals with the value zero on all covariates, assumed to be unknown and left unparameterized), and $\beta'x$ are the covariates and regression parameters (Cox, 1972; Blossfeld and Rohwer, 1995; Box-Steffensmeier and Jones, 2004).

For every woman we built a timeline where we define a starting (date of first birth) and a stopping (date of last birth) and were we register son births and daughter births, child death, and other relevant occurrences. On this timeline we model the extension of conception intervals. That is we define the effects, or relative risks, of different educational and cultural variables on the risk of experiencing a pregnancy.

The covariates we use belongs to the categories we described above. The reference value is always the first value of the covariates. For women's age a category variable that consider seven five-years age groups between 15 and 49 years is used.

Years since first cohabitation gives information about the marital status of the woman. This variable is considered influencing fertility through different channels: secondary fertility linked to parity, decreasing coital frequency, age gap between husband and wife or fertility control dependent on parity (Derosas, 2006).

Preceding conception interval and children birth's vitality have both an impact on additional conceptions. In particular when a child died and breastfeeding is interrupted two mechanisms come into play: a substitution effect or the desire to replace the dead child with a new one; and a natural consequence of interrupting breastfeeding which is a shorter post-partum amenorrhea (Derosas, 2006).

Net parity is a very useful indicator of gender preferences.

Residence, religion and ethnicity are some cultural variables which define the background to which the woman belongs and the values and traditions we expect to influence her fertility behaviour.

Highest education level and literacy are the education variables we decide to use to measure the effect of schooling on the probability of an additional pregnancy.

Finally frequency watching television and wealth index complete the model. We test all the variables separately.

In addition to the Cox Regression, we decide to perform also a Linear Regression on the variable of starting and stopping. The covariates we used are the same of the event history analysis, plus some others we have already described at the beginning of the chapter.

The results we obtained from the linear model are sorted by country and summarised in the tables 3.4, 3.5 and 3.6. The results of the Cox regression are presented in tables 3.7 3.8 and 3.9.

3.6 Results

3.6.1 Linear Regression

Before the event history analysis we perform a linear regression on age at first birth and age at last birth. We use different model specification, to prove the magnitude of the relationship dependent-independent variables.

In the first specification we use, in addition to the control variables, only education as explicative variable. Then we add literacy, religion, residence, television, the presence of a cesareo in the woman reproductive life, amenorrhea, ideal number of children and number of dead children and the wealth index in the last specification.

Results from the regression of year of first birth are presented in table 3.4, 3.5, 3.6, while the others are omitted due to are not significative.

To start with we look at Senegal and Niger. In Senegal all the explicative variables are significative, years of education and literacy have a strong positive effect on age at first birth: one additional year of education increases age at first birth of about 6-7 months, while the ability to read shifts it of more than one year. Also frequency watching television

acts positively on age at first birth. On the contrary residence negatively affects it: a woman living in a rural region anticipate first birth from six months to more than one year. Niger has quite different results. Residence has also a significative and negative effect on the dependent variable, however the magnitude of this effect is larger: living in the countryside decreases age at first birth more than two year in all the model specifications. Amenorrhea is less influencing and frequency watching television has no significant effects. Contrary to Senegal, in Niger literacy is not relevant, while one additional year of education delay the first birth of six months. To notice that in both the countries religion has no significant effects.

It is not a surprise that coefficients for Ghana differs from the ones of the other two countries. Education is not relevant, except for the last three specification of the model where it assumes a slight negative direction. On the contrary literacy is highly effective: being able to read delays age at first birth of 3 years. Also frequency watching television effects positively the pattern of age at first birth. Amenorrhea and Ideal number of children perform similar to Senegal and Niger.

The main differences within these countries is in residence and religion. Residence is not significant, except for the first specification of the model, and has promiscuous directions. Religion is much more important in Ghana, with a small but significative effect.

To sum, from this first analysis some variables (ideal number of children, amenorrhea and frequency watching television) follow a predictable pattern, and differ slightly from state to state. However years of education, literacy, religion and residence follow different and interesting patterns. Year of education is important in the high fertility countries, but not for Ghana, as Castro Martin(1995) suggests. Religion is not significant in the Muslim countries, while it affects age at first birth among Christians. Residence is a stronger predictor for fertility starting in Senegal and Ghana. This result confirms the different pace of rate among Senegal and Niger, respectively at the 154th and 173th rank over 183 in the Doing Business report of the World Bank and Ghana, which is one of the leading countries of SSA.

Table 3.4 Linear Regression age at first birth, Ghana

Source :DHS Survey

		Adding Literacy	Adding Religion	Adding Residence	Adding Frequency Watching Television	Adding Health Variables	Adding Demographic Variables	Adding Wealth Level
Years of Education	-0,030	-0,030	-0,030	-0,029	-0.033*	-0.076***	-0.082***	-0.081***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Literacy		3.664***	3.538***	3.259***	2.876***	3.894***	3.031***	3.131***
		(0.27)	(0.27)	(0.28)	(0.29)	(0.32)	(0.29)	(0.30)
Religion			-0.105**	-0.117**	-0.102*	-0.110*	0,008	0,001
			(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Residence				0.898***	0,376	-0,019	-0,431	-0,186
				(0.23)	(0.25)	(0.27)	(0.25)	(0.32)
Frequency Watching Television					0.553***	0.748***	0.657***	0.703***
					(0.10)	(0.10)	(0.09)	(0.10)
Preceding birth was a cesareo						-0,138	-0,216	-0,193
						(0.35)	(0.33)	(0.33)
Currently Amenorrhic						1.627***	1.321***	1.315***
						(0.25)	(0.23)	(0.23)
Ideal Number of Children							-0.035***	-0.035***
							(0.01)	(0.01)

		Adding Literacy	Adding Religion	Adding Residence	Adding Frequency Watching Television	Adding Health Variables	Adding Demographic Variables	Adding Wealth Level
Number of dead children							-2.284***	-2.299***
							(0.10)	(0.10)
Wealth Level								-0,170
								(0.13)

Table 3.5 Linear Regression age at first birth, Senegal

	Only Education	Adding Literacy	Adding Religion	Adding Residence	Adding Frequency Watching Television	Adding Health Variables	Adding Demographic Variables	Adding Wealth Level
Years of Education	0.742***	0.587***	0.591***	0.626***	0.612***	0.375***	0.220***	0.221***
	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Literacy		1.040***	1.050***	1.129***	1.063***	0.802***	1.014***	1.024***
		(0.24)	(0.24)	(0.24)	(0.24)	(0.24)	(0.22)	(0.22)
Religion			750	0.808*	0,716	1.084**	1.717***	1.724***
			(0.39)	(0.39)	(0.39)	(0.38)	(0.34)	(0.34)
Residence				-0.842***	-1.109***	-0.522**	-0.684***	-0.628***
				(0.15)	(0.16)	(0.16)	(0.15)	(0.16)
Frequency Watching Television					0.356***	0.445***	86	136
					(0.08)	(0.08)	(0.07)	(0.09)
Preceding birth was a cesareo						0,14	0,112	0,112

	Only Education	Adding Literacy	Adding Religion	Adding Residence	Adding Frequency Watching Television	Adding Health Variables	Adding Demographic Variables	Adding Wealth Level
						(0.06)	(0.06)	(0.06)
Currently Amenorrhic						2.013***	1.451***	1.449***
						(0.15)	(0.13)	(0.13)
Ideal Number of Children							-0.013***	-0.012***
							(0.00)	(0.00)
Number of dead children							-2.634***	-2.637***
							(0.06)	(0.06)
Wealth Level								-0,075
								(0.07)

Source: DHS Survey

Table 3.6 Linear Regression age at first birth Niger

	Only Education	Adding Literacy	Adding Religion	Adding Residence	Adding Frequency Watching Television	Adding Health Variables	Adding Demographic Variables	Adding Wealth Level
Years of Education	0.525***	0.516***	0.516***	0.638***	0.635***	0.461***	0.488***	0.484***
	(0.06)	(0.09)	(0.09)	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)
Literacy		0,060	0,068	0,438	0,328	0.895*	-0,230	-0,232
		(0.44)	(0.44)	(0.44)	(0.44)	(0.44)	(0.39)	(0.39)
Religion			0,601	0,489	0,490	1.347*	-0,434	-0,440

	Only Education	Adding Literacy	Adding Religion	Adding Residence	Adding Frequency Watching Television	Adding Health Variables	Adding Demographic Variables	Adding Wealth Level
			(0.58)	(0.58)	(0.58)	(0.58)	(0.51)	(0.51)
Residence				-2.305***	-2.517***	-1.578***	-2.304***	-2.584***
				(0.20)	(0.22)	(0.23)	(0.21)	(0.24)
Frequency Watching Television					0.213*	0,130	0,043	0,024
					(0.09)	(0.10)	(0.08)	(0.09)
Preceding birth was a cesareo						0,316	0,254	0,269
						(0.39)	(0.34)	(0.34)
Currently Amenorrheic						0.915***	0.821***	0.825***
						(0.19)	(0.17)	(0.17)
Ideal Number of Children							-0.015***	-0.015***
							(0.00)	(0.00)
Number of dead children							-1.976***	-1.978***
							(0.05)	(0.05)
Wealth Level								0.139*
								(0.06)

Source DHS Survey

3.6.2 Cox hazard model with continuous time

With a general look at the tables on Cox Regression two main elements stand out: in most of the cases the effects of the covariates follow the same direction in all the countries under analysis, however the magnitude of these effects changes from Ghana to Senegal and Niger.

The age pattern of the hazard ratio of an additional conception is consistent across Ghana and Senegal. Women which belong to the 20-24 and 25-29 years group have an higher possibility (around 1% for Ghana and 0.5% for Senegal) with respect to younger women to have another conception, while older women have a smaller likelihood of another pregnancy, which strongly decreases toward the oldest group. In Niger there is no this difference of the effect between groups, and all the women, following a decreasing pattern, have an hazard ratio lower than one. In practical terms this means that in Niger the reproductive life of the woman starts before, and ends before, with respect to the other two countries. This result is not surprising considering Niger is the country with one of the highest fertility rate in SSA.

The length of cohabitation influences negatively the dependent variable in all the countries. However this negative effect is stronger in Ghana where the hazard ratio is respectively 10% lower and 20-30% lower than the others for the 10-19 and 20 + intervals. We need to keep in strong consideration to all these results, due to they are highly significant.

The likelihood functions of a pregnancy for the net parity are not as significant as the previous one, however they convey some useful information.

First net parity seems to have no effect in Senegal, while in Ghana and Niger assume a negative role. In both the country the presence of an high number of sons reduce the probability of another pregnancy, while families with only or more daughters will probably look for a male. Net parity confirm that gender preferences are biased toward male births. As shown in the tables residence has a significative effect of the likelihood function, and households living in towns have a lower probability of another pregnancy than rural families . Similar to the other cases this probability is lower for Ghana (around 88%) than for Senegal and Niger (around 93%).

The religion pattern in the hazard ratio is singular. It is smaller and not significant in Ghana, while it increases from Senegal to Niger. Both the countries have an high share of Muslim, however being Christian in Niger means to have a probability of another conception around 30% less than Moslems. This is very close to the claim of Blunch (2008) that the effect of religion on fertility behaviour is much more stronger where the

level of education is much more lower. The effect of the other religions, like animist, is not so different from the reference one. Probably the percentage of people following traditional worship is too low to have some importance, or probably the behaviour they follow are really close to the muslims' ones.

Particularly interesting is the pattern of ethnicity. First it is an high significative variable for all the countries. Then results show that belonging to a specific ethnic group, and controlling for other social and economic elements, changes the attitude of the household toward fertility choices, increasing or decreasing the hazard ratio. Therefore ethnicity, that is the rules, the traditions and the identity of a group (Caldwell, 1980) should be considered as a key variable, worth to be studied in the future.

We will not comment on literacy, which is not significant, but we will focus on the effect of the highest educational level. Surprisingly the effect of education on fertility is almost the same across the countries. We have to remember we chose Ghana Senegal and Niger because they have three different level of fertility rate and so should be at three different stages of the Demographic Transition. According to Castro Martin(1995) this should justify three different magnitude of the education effect, with Ghana characterised by the smaller one. However our data tell another story. A solution can be find looking at the proportion of the population at the different levels. In Ghana more than half of the population has some education while in Senegal and Niger only the 15/20%. As a results in Ghana the positive effect of schooling reaches an higher share of the population, justifying an influence of education similar to Senegal and Niger together with a lower fertility rate.

Frequency watching television is the variable which represent the access to media, a principal mean of modernisation according to Basu(2002). In this case result for Ghana are not significative however the hazard ratio for Senegal and Niger are encouraging. In Senegal a woman that watches television at least once a week has 10% probability less than a woman who does not watch television at all for another conception. Niger follows the same pattern. Finally the effect of wealth is clearly predictable in Ghana and Senegal: higher wealth means higher modernisation and so family planning. However this is not the case in Niger. Here the hazard ratio remains almost the same across the different wealth levels.

Table 3.7 Results of Cox Regression Ghana

		Ghana	
	Proportion	Hazard Ration	P-Value
MOTHER'S AGE (YEARS)			
15-19	0.157388	1	
20-24	0.281974	1.0997	0.0192
25-29	0.265117	1.1052	0.0290
30-34	0.172522	0.9736	0.6282
35-39	0.090230	0.8322	0.0085
40-44	0.028579	0.6729	0.0004
45-49	0.004189	0.2399	0.0002
TIME SINCE FIRST COHABITATION (YEARS)			
0-9	0.624215	1	
10-19	0.306804	0.7860	0.0000
20 +	0.068982	0.4474	0.0000
PRECEDING BIRTH INTERVAL AND CHILDREN BIRTH'S VITALITY			
child is alive	0.939295	1	
child died between 0-8 months	0.047733	1.7004	0.0000
child died after 8 months	0.012972	1.3776	0.0000
NET PARITY (M ; F)			
0 / 0	0.023748	1	
1 / 0	0.149956	0.8412	0.0342
1+ / 0	0.085400	0.7700	0.0050
0 / 1	0.152219	0.8223	0.0157
1 / 1	0.116141	0.8007	0.0118
1+ / 1	0.112425	0.8077	0.0290
0 / 1+	0.097020	0.8321	0.0449
1 / 1+	0.108303	0.7835	0.0132
1+ / 1+	0.154787	0.7140	0.0020
PARITY	3.031417	1.0315	0.0193
RESIDENCE			
rural	0.665529	1	
urban	0.334471	0.8755	0.0001
RELIGION			

		Ghana	
	Proportion	Hazard Ration	P-Value
muslim	0.173569	1	
christian	0.676407	0.9227	0.0194
other	0.150024	1.0229	0.5820
ETHNICITY			
akan	0.408689	1	
others	0.591311	0.8784	0.0000
HIGHEST EDUCATION LEVEL			
no education	0.429194	1	
primary	0.221066	0.9036	0.0017
secondary or higher	0.349740	0.7447	0.0000
LITERACY			
illiterate	0.750929	1	
semiliterate	0.102257	0.9400	0.1947
literate	0.146814	0.9293	0.1252
FREQUENCY WATCHING TELEVISION			
Ghana			
not at all	0.561955	1	
less than once a week	0.080366	0.9622	0.3993
more than once a week	0.163975	0.9071	0.0064
every day	0.193703	0.9123	0.0268
WEALTH LEVEL			
poorest	0.302615	1	
poorer	0.221032	0.9027	0.0026
middle	0.187150	0.8592	0.0002
richer	0.164178	0.7517	0.0000
richest	0.125025	0.7305	0.0000
CDR	0.000722		
Events	7501		
Toral Time	10389989.000000		
Partial Max Log Likelihood	- 64293.17 (254 mldf)		
Chisq	1315.45 (df=34)		

Source: DHS Survey

Table 3.8 Results of Cox Regression Senegal

		Senegal	
	Proportion	Hazard Ration	P-Value
MOTHER'S AGE (YEARS)			
15-19	0.1979	1	
20-24	0.2893	1.0614	0.0012
25-29	0.2459	1.0408	0.0215
30-34	0.1593	0.9059	0.0002
35-39	0.0802	0.7040	0.0000
40-44	0.0240	0.4272	0.0000
45-49	0.0033	0.2048	0.0000
TIME SINCE FIRST COHABITATION (YEARS)			
0-9	0.6049	1	
10-19	0.3149	0.9058	0.0000
20 +	0.0801	0.6431	0.0000
PRECEDING BIRTH INTERVAL AND CHILDREN BIRTH'S VITALITY			
child is alive	0.9403	1	
child died between 0-8 months	0.0470	1.4589	0.0000
child died after 8 months	0.0127	1.2207	0.0000
NET PARITY (M ; F)			
0 / 0	0.0221	1	
1 / 0	0.1353	0.9979	0.9618
1+ / 0	0.0922	1.0370	0.4544
0 / 1	0.1338	1.0083	0.8524
1 / 1	0.1072	0.9856	0.7576
1+ / 1	0.1176	1.0072	0.8885
0 / 1+	0.0851	1.0471	0.3459
1 / 1+	0.1109	1.0159	0.7577
1+ / 1+	0.1955	1.0326	0.5639
PARITY	3.3598	1.0029	0.6346
RESIDENCE			
rural	0.6981	1	

		Senegal	
	Proportion	Hazard Ration	P-Value
urban	0.3018	0.9278	0.0000
RELIGION			
muslim	0.9583	1	
christian	0.0325	0.8715	0.0001
other	0.0091	1.0309	0.6117
ETHNICITY			
popular	0.3444	1	
wolof	0.3129	1.0815	0.0000
serer	0.1272	1.1305	0.0000
others	0.2153	1.0373	0.6117
HIGHEST EDUCATION LEVEL			
no education	0.8085	1	
primary	0.1476	0.8835	0.0000
secondary or higher	0.0438	0.7847	0.0000
LITERACY			
illiterate	0.8312	1	
semiliterate	0.0677	1.0322	0.2471
literate	0.1011	1.0041	0.9001
FREQUENCY WATCHING TELEVISION			
not at all	0.4316	1	
less than once a week	0.1709	0.9402	0.0003
at least onve a week	0.3975	0.9261	0.0001
WEALTH LEVEL			
poorest	0.3101	1	
poorer	0.2610	0.9534	0.0023
middle	0.2116	0.9150	0.0000
richer	0.1363	0.8218	0.0000
richest	0.0808	0.7096	0.0000
CDR	0.000946		
Events	29231		
Toral Time	30897556.000000		

		Senegal	
	Proportion	Hazard Ration	P-Value
Partial Max Log Likelihood	- 285968.07 (259 mldf)		
Chisq	2861.04 (df=35)		

Source DHS Survey

Table 3.9 Result of Cox Regression Niger

		Niger	
	Proportion	Hazard Ration	P-Value
MOTHER'S AGE (YEARS)			
15-19	0.2373	1	
20-24	0.3004	0.9659	0.0650
25-29	0.2210	0.9240	0.0026
30-34	0.1430	0.8048	0.0000
35-39	0.0742	0.6925	0.0000
40-44	0.0214	0.3092	0.0000
45-49	0.0023	0.1710	0.0000
TIME SINCE FIRST COHABITATION (YEARS)			
0-9	0.5607	1	
10-19	0.3440	0.9017	0.0000
20 +	0.0952	0.7077	0.0000
PRECEDING BIRTH INTERVAL AND CHILDREN BIRTH'S VITALITY			
child is alive	0.9157	1	
child died between 0-8 months	0.0593	1.5658	0.0000
child died after 8 months	0.0248	1.1920	0.0000
NET PARITY (M ; F)			
0 / 0	0.0312	1	
1 / 0	0.1301	0.9033	0.0092
1+ / 0	0.0875	0.9040	0.0222
0 / 1	0.1247	0.9567	0.2594
1 / 1	0.1040	0.9361	0.1178
1+ / 1	0.1178	0.9136	0.0492

		Niger	
	Proportion	Hazard Ration	P-Value
0 / 1+	0.0822	0.9227	0.0680
1 / 1+	0.1130	0.9182	0.0629
1+ / 1+	0.2089	0.9092	0.0533
PARITY	3.8135	1.0123	0.0290
RESIDENCE			
rural	0.7132	1	
urban	0.2867	0.9372	0.0049
RELIGION			
muslim	0.9855	1	
christian	0.0056	0.7229	0.0003
other	0.0088	1.0016	0.9801
HIGHEST EDUCATION LEVEL			
no education	0.8649	1	
primary	0.0944	0.9530	0.1075
secondary or higher	0.0406	0.7855	0.0001
LITERACY	0.9010	1	
illiterate	0.0368	1.0019	0.9639
semiliterate	0.0621	0.9919	0.8774
literate			
FREQUENCY WATCHING TELEVISION			
not at all	0.8293	1	
sometimes or everyday	0.1706	0.9123	0.0000
ETHNICITY			
haoussa	0.4600	1	
djerma	0.2276	0.8587	0.0000
rtouareg	0.1289	0.9040	0.0000
others	0.1834	0.9145	0.0000
WEALTH LEVEL			
poorest	0.1889	1	
poorer	0.1668	0.9775	0.2752
middle	0.1687	1.0012	0.9555

	Niger		
	Proportion	Hazard Ration	P-Value
richer	0.1983	0.9821	0.3836
richest	0.2770	0.9817	0.4955
CDR	0.001154		
Events	25704		
Toral Time	22277271.000000		
Partial Max Log Likelihood	- 244700.24 (258 mldf)		
Chisq	2413.59 (df= 34)		

Source DHS Survey

3.7 Conclusions

In the last part of this work we would like to sum the major findings of our investigation.

With this study we try to answer some questions about the existence and the characteristics of the relation between education and fertility, and how it changes for different social, cultural and demographic backgrounds. For data quality and availability we decide to work on three countries in SSA, Ghana, Senegal and Niger. The differences of the fertility rate is used as the selection criterium.

First and foremost, our work confirms that the relation between fertility and education actually exists in all the countries under study. This relation assumes a positive direction, and help to lower fertility delaying the starting of the woman reproductive activity and increasing the spacing between conceptions. Following the indication of Castro Martin (1995), we expect to find a different magnitude in the effect of education on conception intervals in relation to the position of the states in the Demographic Transition. However from our results, hazard ratios for women are similar in Ghana, Senegal and Niger.

A second complex issue centres on which are the variables that also play a role in fertility decisions. We decide to focus on social, cultural and demographic variables such as religion, residence, access to media, fertility preferences and parity. The most notable finding is that all covariates are significative. Residence ethnicity and demographic variables are the most relevant. In particular the effect of ethnicity, which assumes different directions in different countries, rises interesting questions for future researches.

Noteworthy is also religion, which is more influent in high fertility, less educated Senegal and Niger. One last observation is, despite the result for education, that the country background and timing in fertility transition shape a bit the effect of the covariates. For example Ghana, the most advance of the three nations, is more sensible to “modern” variables such as frequency watching television and wealth level.

In practical terms the results of our study suggests the education is a variable to use in policy interventions for a lower fertility rate. However some additional findings suggest that when we design these policy we need to take into account the ethnical, religious and geopolitical background of a country. In Ghana media should be used to advertise for contraception methods or family planning. In Senegal we should focus on the dynamics of the ethnic groups. In Niger it useless to convey information through media, while religious and ethnic nets should be exploited.

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