Demographic Transition and Education in Developing Countries

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Keywords: demographic transition, education, fertility, development, mortality, gender, developing countries

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Summary

The demographic transition is a concept developed to indicate the demographic passage of populations from the status of traditional societies where both fertility and mortality rates are high to the status of modern societies where both fertility and mortality rates are low. Contrary to the European demographic transition that was long-lasting and accompanied by weak growth rates, the transition from high birth and mortality rates to low birth and mortality rates in developing countries started only in the second half of the twentieth century; it was more rapid but also accompanied by higher growth rates of the population, up to three to four percent per year... and it is still underway. In this framework, education received a lot of attention because it was proved to increase the likelihood and the pace of the transition due to its impact on fertility and mortality curves. This is especially true of female education: More educated women are healthier, bearing fewer and healthier children, than women with little or no education at all. Several models have been put forward to explain the factors through which education will affect the population in their choice of a certain pattern of fertility behavior. However, all theories agree on the point that education has a major role to play in the fertility decline. The education-fertility relationship is very relevant because the education level of a society can be directly influenced by government policy. This brings the State to be a key variable in the demographic transition that is clearly tied up with development prospects.

1. Introduction

The pompous term of demographic transition hides a very important phenomenon of the nineteenth and especially twentieth century. Before the transition started, mortality levels were very high everywhere in the world; populations could only maintain or increase their size by following very high fertility patterns. The decline in mortality

levels that occurred at the beginning of the transition caused a major disequilibrium that induced necessary adjustments downward of fertility levels.

However, the transition from high mortality and high fertility rates (traditional societies) to low mortality and low fertility levels (modern societies) did not take place at the same time everywhere, and more importantly, countries adopted very different paces for the transition. The European transition had started already in the nineteenth century. It was extended over a long period and population growth rates rarely exceeded two percent. On the other hand, the transition in developing countries started only in the second half of the twentieth century. The transition was more rapid but also accompanied by higher growth rates of the population, up to three to four percent per year.

The transition is still an on-going process in many developing countries. In fact, over the last decades, the fertility in a majority of countries has dropped considerably, but the speed of the fertility decline in those countries where population growth is still high will have many implications for sustainable development. Figure 1 represents the total fertility rate (TFR) in 1950 and 2000 on the x-axis, and the difference between those two TFRs on the y-axis. It shows that in 1950 women in a majority of countries, i.e. 127 countries, were bearing more than five children, whereas in 2000 the women of more than 100 countries had on average less than three children. The countries that are positioned along the red line, when the TFR is above three children, will be the ones for which the speed of the fertility decline between now and the next years will be of importance.

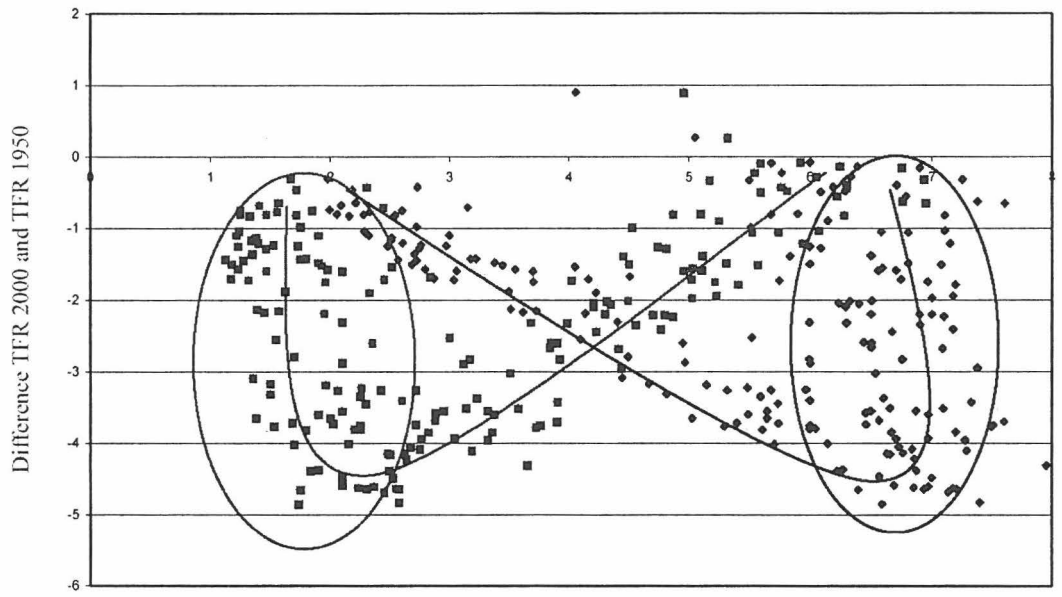

Figure 1: Total fertility rate in the years 1950 and 2000, by the difference between the TFR in 2000 and the TFR in 1950, by country

In this frame, education and the education of women in particular have been assessed to play a particular role in the demographic transition process in developing countries.

Education may increase the likelihood and the pace of the transition because of its impact on fertility and mortality curves. Better-educated women have fewer and healthier children, and better health themselves, than women with little or no education. Moreover, the education-fertility relationship is very relevant because the education level of a society can be directly influenced by government policy. This brings the State to be a key variable in the demographic transition.

Parallel to the demographic transition, there has also been an education transition. Significant progress has been made over a large range of developing countries in both primary and secondary school enrollment (Figure 2). While industrialized countries and Latin America, together with the Caribbean region, have achieved universal literacy, 10-13 average school years among adults, and equal education for men and women at all levels of the schooling scale, some countries in Africa and Asia (e.g. Burkina Faso, Mozambique, Niger, Afghanistan, Bangladesh, Pakistan) still had illiteracy rates above 60 percent in 1995 among the adult population. The literacy rates of girls continue to lag behind those of boys in many regions, especially in Asia, the Arab States and Sub-Saharan Africa.

Figure 2 shows that in all regions of the developing world, with the exception of Latin America, and at all schooling levels, men had higher enrollment rates than women. The data also show, however, that the female to male ratios in enrollment rates decreased in all the world regions throughout the observation period without exception. In general, the female to male ratios in enrollment were higher in countries with a generally higher enrollment rate. There is a rough geographical distribution of the levels of development in education. Most of the countries in the low education/high gender gap area are in Africa; most of the countries in the medium education/medium gender gap are in Asia and Latin America; and most of the high education/no gender gap countries are in Europe and North America. This itself may be related to the level of development.

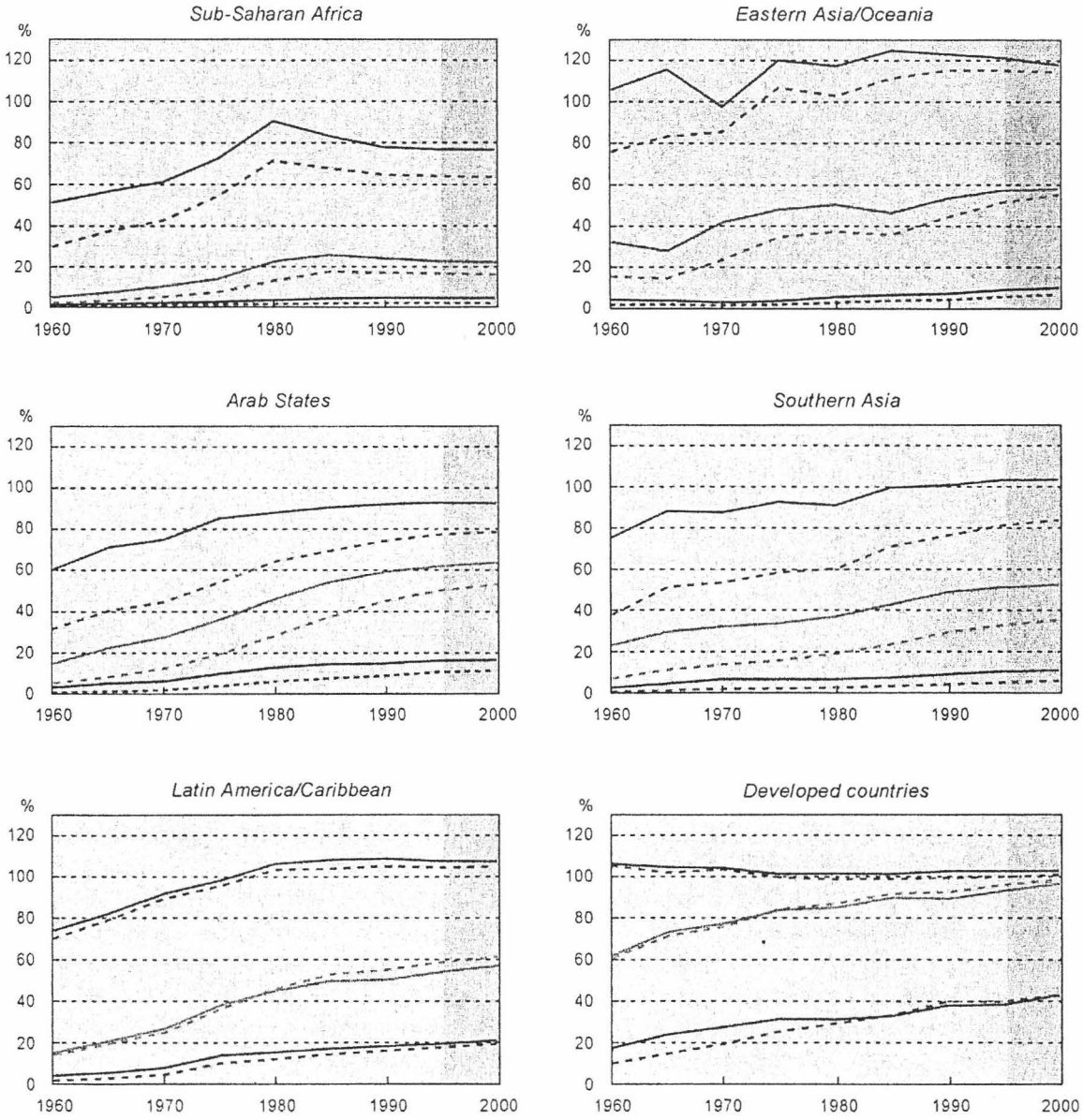

Figure 2: Trends in estimated male and female gross enrolment ratios, by level of education and region, 1960-2000

The demographic and education transitions are linked through the correlation between women's education and various aspects of their reproductive behavior. The findings from the many studies that have been pointing to education as an important factor of heterogeneity in fertility within populations are reviewed in the first section. Education has been very present in demographic research in addressing two separate sets of issues. The first one is that differentials by education characteristics may indicate the considerations that underlay fertility decisions and second, that the interpretation of differentials according to education characteristics over time is central to the study of fertility change.

However, as will be shown in section two and three, education is more than a fertility deflator. It plays a crucial role in individuals' well-being and social progress. Moreover, measures of the educational attainment of populations have been important explanations of growth success. Recent studies indicate that education matters over and above its effect as an additional input to production; at the country and firm level, it is associated with higher total factor productivity, that is, with higher product with given inputs.

2. Education and Fertility

2.1. Trends and Patterns

The first round of World Fertility Surveys (WFS) shed light on the causal linkages between education and fertility in a large number of developing countries and across a wide range of societies. A new round of data from Demographic and Health Surveys (DHS) conducted in the late 1980s and 1990s, 10–15 years after the WFS, gave the opportunity to re-examine and deepen the knowledge on the education-fertility relationship from a cross-national perspective. Moreover, the availability of two surveys offered the possibility to analyze time series in countries that experienced both rounds of WFS and DHS.

These studies gave evidence that countries where women are better educated have in general lower fertility levels than countries where women are poorly educated. The most striking proof of female education acting as a major source of fertility differentials is a comparison of fertility levels among education groups of women. As shown in Table 1, the fertility of women located at the upper end of the education continuum (women with higher education who have at least completed secondary education) is always lower than the fertility of women at the lower ends of the continuum (women with less than one year of education). The study of the data harvested during the World Fertility Surveys showed that the most meaningful of the indicators examined were the level of female education and the percentage of women who had worked in non-agricultural occupations. If comparing the ages at marriage and the levels of education of women aged 40-49 and women aged 25-29 at the time of survey, it seems that the link between menarche and marriage is broken when girls remain in school; beyond menarche, implying at least completion of primary schooling.

Countries	Total Fertility Rates (TFR)					
	Total	No education (A)	Primary education	Secondary education	Higher education (B)	Difference (A) - (B)
Africa						
Benin, 1996	6.0	6.6	4.8	3.0	1.3	5.3
Burkina, 1993	6.5	6.8	5.6	3.0	2.7	4.2
Cameroon, 1991	5.8	6.2	6.4	4.6	3.2	3.0
CAR, 1995	5.1	5.2	5.3	4.0	1.9	3.3
Comoros, 1996	4.7	5.3	4.8	3.6	1.8	3.5
Egypt, 1996	3.6	4.6	3.5	2.4	2.5	2.0

Ghana, 1994	5.2	6.0	5.0	3.1	1.9	4.1
Ivory Coast, 1994	5.3	5.8	4.9	3.4	1.9	3.9
Kenya, 1998	4.7	5.8	5.0	3.6	3.0	2.8
Madagascar, 1997	6.0	6.8	6.5	4.4	2.0	4.8
Malawi, 1992	6.7	7.2	6.4	4.5	1.4	5.8
Mali, 1996	6.7	7.1	6.5	4.2	2.3	4.8
Morocco, 1992	4.0	4.9	2.4	2.1	1.9	3.0
Mozambique, 1997	5.2	5.1	5.4	3.5	1.4	3.7
Namibia, 1992	5.4	6.6	6.0	4.2	2.9	3.6
Niger, 1998	7.2	7.5	6.2	5.1	2.7	4.8
Nigeria, 1990	6.0	6.5	6.3	4.9	2.0	4.5
Rwanda, 1992	6.2	7.0	5.9	4.3	3.0	4.0
Senegal, 1997	5.7	6.3	5.2	3.3	2.1	4.2
Tanzania, 1996	5.8	6.4	5.6	3.1	2.4	4.0
Chad, 1997	6.4	6.4	6.7	4.9	3.4	3.0
Togo, 1998	5.2	6.3	4.6	2.7	1.3	5.0
Uganda, 1995	6.9	7.0	7.1	5.2	2.0	5.1
Zambia, 1997	6.1	6.8	6.7	4.8	2.9	3.9
Zimbabwe, 1994	4.3	5.2	4.7	3.3	2.7	2.5
Asia						
Bangladesh, 1997	3.3	3.9	3.2	2.2	2.0	2.0
India, 1992	3.4	4.0	3.0	2.4	2.1	1.9
Indonesia, 1997	2.8	2.7	3.1	2.7	1.9	0.8
Jordan, 1990	5.6	6.9	6.0	5.4	4.1	2.8
Nepal, 1996	4.6	5.1	3.8	2.5	2.3	2.8
Philippines, 1998	3.7	5.0	5.0	3.6	2.9	2.1
Turkey, 1993	2.5	4.1	2.3	1.8	1.4	2.8
Latin America and Caribbean						
Bolivia, 1997	4.2	7.1	5.7	3.3	2.2	5.0
Brazil, 1996	2.5	5.0	3.3	2.1	1.5	3.5
Colombia, 1995	3.0	5.0	3.8	2.6	1.8	3.1
Dominican, 1996	3.2	5.0	3.7	2.6	1.9	3.1
Guatemala, 1995	5.1	7.1	5.1	2.7	1.8	5.3
Haiti, 1995	4.8	6.1	4.8	2.5	1.9	4.2
Nicaragua, 1998	3.6	5.7	4.2	2.7	1.5	4.2
Paraguay, 1990	4.7	6.5	5.5	3.4	2.7	3.8
Peru, 1996	3.5	6.9	5.0	3.0	2.1	4.8

Table 1: Fertility differentials by women's education in the period 1990-1998 extracted from selected Demographic and Health Surveys

More recently studies show that fertility differentials between the upper and lower education groups tend to cluster regionally, with linkages to the level of socio-economic development, the stage of the demographic transition, the stage in the level of mass education and the cultural setting. The narrowest fertility gaps are mostly observed in

countries quite advanced in the process of development and in the demographic transition towards low mortality and fertility levels such as Bangladesh, Egypt, India, and Indonesia. The largest differentials are found in settings of early development where the transition to a 'modern' style of life has reached a small fragment of the population such as most African countries. The difference is more than five children between the fertility of women with the highest and lowest level of education considered in Benin, Malawi, Togo, and Uganda. The difference is also large in Latin American countries with a setting of medium development. Most countries in that region position themselves halfway through the process of demographic transition. The difference is more than four children between the fertility of women with the highest and lowest level of education considered in Bolivia, Guatemala, Haiti, Nicaragua and Peru.

The strength of the relationship was put into question in a number of cases. If the relationship is clear between the fertility of women with highest and lowest levels of education, it is not always the case at the lower spectrum of education levels. There, education may increase or decrease individual fertility. Sometimes the fertility differentials between women with no education at all, 1–3 years, and 4–6 years are very small: it is less than one year in most sub-Saharan African countries. And sometimes, the relationship appears to be negative. For instance, Table 1 shows that women with a primary education had slightly more children (maximum 0.3) than women with no education at all in the countries of Cameroon, Central African Republic, Chad, Indonesia, Mozambique, and Uganda. It seems that in countries with the lowest level of female literacy, education initially increases the ability to have live births, probably through improved health, better nutrition and the abandoning of traditional patterns of lactation and post-partum abstinence. Initially, this effect seems to be strong enough to counteract the effect of education on the postponement of marriage. The introduction into analyses of proximate determinants of fertility and multi-level analysis advanced the research. It was proved that at low levels of development, the main effect of formal education is to erode traditional restraints and thereby raise fertility. Its main effect at higher levels is to decrease fertility by reducing the desire for children, which is expressed in the use of birth control.

The phenomenon that at the early stage of development, in countries with the lowest level of female literacy or in some cultural settings, education may lead to an increase in fertility after a brief exposure to schooling was very detrimental in a way to the cause of increasing levels of enrollment for women. A few authors reflecting on the policy implications of the WFS findings acknowledge the strong linkages existing between education and fertility determinants but deny that rising education should be promoted as a panacea for high fertility. The causality of the link between women's education and fertility was debated, as well as the cost effectiveness of education to reduce fertility. The debates obliterated the fact that the inverse relationship between education and fertility is only present at low levels of education; at higher levels, education levels are consistently negative in their relationship to fertility.

The strong negative relationship between women's schooling and education has been shown convincingly through many scientific studies. These studies point out that, in societies with higher average levels of female literacy, education lowers the demand for

children by altering their perceived costs and benefits. In addition, once the biological supply of children exceeds the demand for them, high levels of education enable couples to limit their fertility more efficiently through more access to contraceptive knowledge and improved ability to communicate with each other. Furthermore, empirical findings indicate that the pattern of the relationship between education and fertility varies by the level of development. Four fertility-education patterns have been observed, depending on the level of development. These patterns are represented in figure 3. Pattern A to C can be often found through the observed relationships in developing countries whereas the D-line is clearly a pattern to be expected more in developed countries.

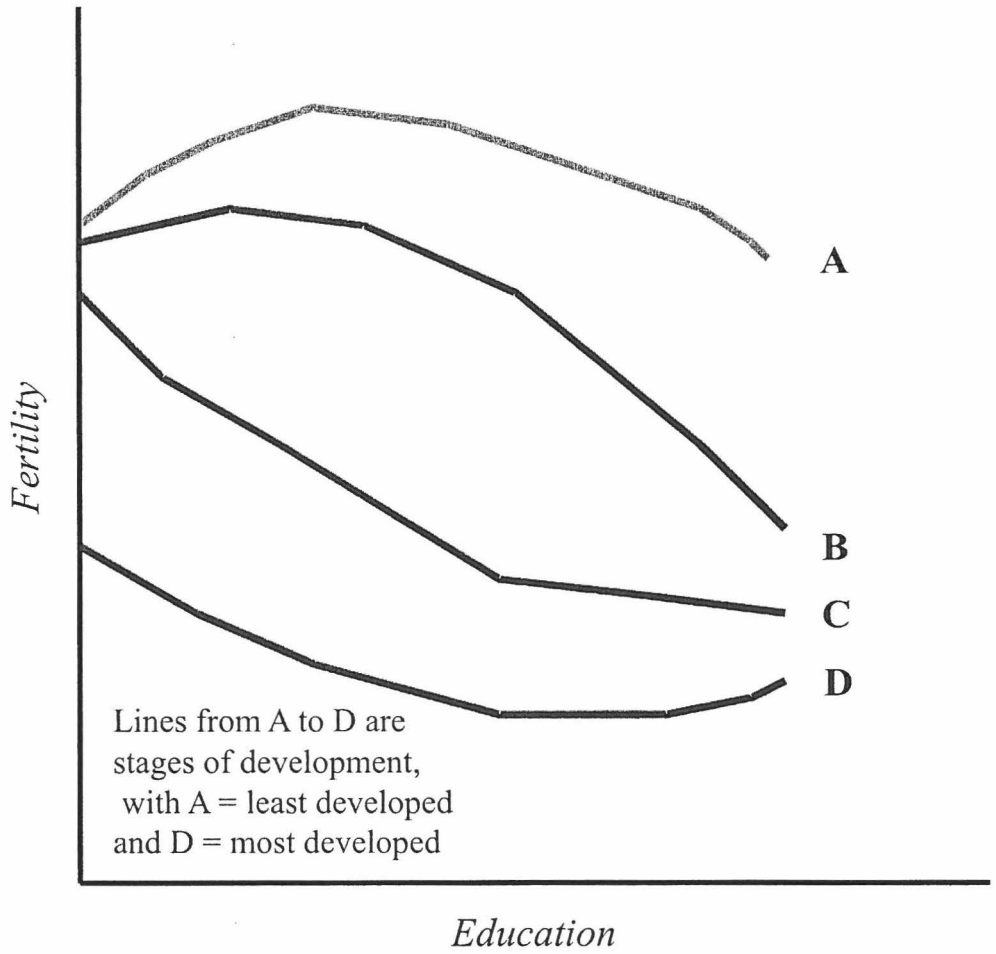

Figure 3: Hypothesized relationship between fertility and education at different levels of development

Many studies have been attempting to measure the net effect of education on fertility; that is, to ascertain whether the observed relationship between education and fertility can be partly attributed to other characteristics linked to education. In Sub-Saharan Africa, education was found to have a weak effect on fertility. In many countries, the effect of female education loses its statistical significance once controls for demographic and socio-economic factors are introduced. But in most countries, it showed that the relationship between women's education and cumulative fertility

remains statistically significant after controlling for demographic (marital duration, age at marriage, and parity) and socio-economic (husband's education, rural/urban residence, family planning activities) factors. According to findings from statistical analysis based on fixed-effect estimates, increasing the schooling of women is the best predictor for reducing fertility and curbing population growth, when compared to the other explanatory variables.

To capture the complex nature of the fertility-education relation, multivariate models have been developed. They are based on the premise that the effect of education on fertility is not direct. Education acts through many other variables that in turn determine fertility. Accordingly, the role of different other variables in the relationship between education and fertility need to be controlled for. A survey of the empirical findings for studies based on tabular and multivariate analysis (Cochrane, 1979), illustrated the important roles of place of residence, of husband versus wife education, and income in the fertility-education relation. For example, studies using aggregate data and those based on individual level analysis show that education and fertility are more likely to be inversely related in urban than in rural areas and that the relation may differ for male and female education. Cross-tabular studies of individuals show that the education of women is more likely to be inversely related to fertility than is that of men. Furthermore, when income is controlled, the education of women and fertility are even more likely to be inversely related than otherwise. This is not the case for the education of fathers.

The strong relation between the wife's education and fertility has been documented in other empirical studies. For example, in a 1988 study based on regression analysis of the effects of parents' education and a number of other explanatory variables on marital fertility, using data from 38 countries conducted during the World Fertility Survey, it was found that the wife's education is strongly associated with fertility behavior, notably in Latin America and in the Arab States. In these two regions, the net effects of the wife's education compared to those of the husband are particularly large. The effects of women's education on fertility limitation and the level of child bearing are less pronounced in Asia and in Africa. With the exception of Africa, where the impact of the wife's schooling does not reflect correlated socio-economic factors, between thirty and fifty percent of the effects of women's education on fertility rates were found attributable to correlated socio-economic factors (characteristics of husband, place of residence or differences in age at marriage) rather than to a more direct influence of women's exposure to modern schooling.

The differential in fertility levels by the mother's level of education changes in time. For example, in Colombia, the Dominican Republic, Ecuador, and Peru between the two rounds of WFS and DHS, the differentials had remained large. However, the educational attainment of adult women was increasing rapidly enough to produce an important amount of fertility decline, simply by increasing the proportion of those women who have reached the higher levels of education. Improvements in education were found to explain 40-67 percent of the decline in fertility. In a recent review that covered 59 studies (Jejeebhoy 1995) it was reported that fewer than half the studies (26) find a straight inverse relationship between education and fertility; 13 studies find that women with a small amount of education bear more children than do either uneducated

or more educated women; 13 studies find that uneducated women and those with a small amount of education have the same number of children, and women with more education have fewer; 7 studies find a positive or no relationship between women's education and fertility. The countries in which there is either no or a positive relationship were almost exclusively in Sub-Saharan Africa. To examine the patterns of change in the education-fertility relation over time, the review focused on the 20 countries that have comparable data at two points in time. These countries show that the pattern of differentials changes over time and that it mostly shifts from non-inverse to inverse. These findings indicate that in 6 settings, the relationship remains non-inverse at both times; in 4 others, it remains inverse at both times; in the remaining 10, it shifts from non-inverse to inverse. However, a number of the sub-Saharan African studies in that survey were quite outdated. Newer evidence from 14 demographic and Health surveys find only four cases of a positive association between fertility and a small amount of education. On the whole, survey findings confirm the earlier evidence that higher levels of parental education are associated with the greater use of birth control and lowered marital fertility. It tends to be stronger than the effect of more purely economic characteristics of couples, such as income, husband's occupation, or standard of living. Furthermore, the link between parental education and fertility persists when these economic factors are controlled through multiple regression analysis; and it holds in both urban and rural settings.

2.2. Models of Explanation

The people's levels of education were found from the beginning of population theory as a factor of heterogeneity that could influence the demographic course of populations. Condorcet was not a demographer as such but a mathematician, historian of the sciences, social reformer and prophet of human progress. He exposed in his main book, *Sketch for a Historical Picture of the Progress of the Human Mind*, published in 1798, that the more active and numerous class of the society is subject to inequality, dependence and misery. He suggests that equality to education, meaning equality in access to schooling, will bring light to the people -- i.e. autonomy, equality of wealth, democracy, civism, science against witchcraft, and, moreover, it will erase as well the limits: the limits of the mind, the limits of science. He predicts that the development of science will increase agricultural productivity. This will produce a wider range of possible enjoyment to humans that could lead to high population growth. Condorcet then reaches from a positivist side in his reasoning a very Malthusian question as to whether this concomitant increase in food production and increase in population would not finally contradict one another when the number of heads would surpass the means to feed them. From this would result a decrease of wealth and of population through a periodical oscillation causing recurrent periods of misery. Condorcet then asks whether this would not be indeed the limit to improvement, to what he most believes in: the perfectionability of the human kind. But the natural optimism of Condorcet and his unlimited faith in the human mind bring him to conclude that through education and progress of science, mankind will come to understand that their duty towards the next generation is not to give birth to them but happiness, meaning well-being of the society and families, and will renounce the 'childish' idea of loading the earth with useless and unhappy beings.

Malthus in his several editions of *An Essay on the Principle of Population* argues that population, unless checked, tends to increase more than the production of food supplies. He distinguishes between two kinds of checks. The positive checks -- such as "all unwholesome occupations, severe labor and exposure to the seasons, extreme poverty, bad nursing of children, great towns, excesses of all kind, the whole train of common diseases and epidemics, wars, pestilence, plague, and famine" (Malthus, 1803) -- will increase death rates. The preventive checks act on birth rates through moral restraint, birth control, and delayed marriage. The first editions of his essay gave a very pessimistic view of the human future where he judged the poor classes incapable of the reasoning and moral restraints that would avoid these population oscillations (checks) to adapt population to the existing means of subsistence. As he advanced in age, he became milder and developed some optimism especially on the possibility of a progress of nations. He then stated that the spread of education to all classes was a way through which population growth could be maintained within the earth's carrying capacity.

In the research of causes for the demographic transition that occurred in Western countries in the nineteenth and twentieth centuries, industrialization was singled out as the main trigger, with all its components: production system, appearance of new social class, urban migrations, increase in levels of enrollment for both sexes have lead to a decrease of mortality rates, a decrease of population living in rural settings, as well as a weakening of traditional family structure. When applied to developing countries, the perspective was changed with more emphasis on cultural and societal change rather than economic development, the former being the prerequisite for economic development. Later, more and more doubts were raised about the independence of the two phenomena, and it was shown that the reproductive behavior was more a natural consequence of economic development than a prerequisite.

There are three main models of explanation of the special relationship between education and fertility associated with the names of Davis and Blake (1956), Easterlin and Crimmins (1985), and Caldwell (1982). These are summarized below. Although they differ on the analysis of the factors through which education will affect the population in their choice of a certain pattern of fertility behavior, all theories agree on the point that education has a major role to play in the fertility decline.

(1) The Davis-Blake framework: The framework focuses on the biological and behavioral dimensions of human fertility. It links the two dimensions through a set of proximate determinants or intermediate fertility variables. These proximate determinants have a direct influence on fertility. Socio-economic factors, health and nutrition influence the proximate determinants. Education was found to influence controlled fertility and its proximate determinants: marriage, contraception, and induced abortion. Demographers and sociologists further modeled the framework.

(2) The Easterlin and Crimmins Framework: The framework is a further evolution of the work done by Davis and Blake on proximate determinant analysis. They placed the transition in a market context and children enter the model as consumption goods. Easterlin and Crimmins single out one subset of proximate determinants having to do with deliberate fertility control variables and leave the other set together: exposure to intercourse, fecundability, duration of post-partum infecundability, spontaneous intra-

uterine mortality, and sterility. Another set of variables is inserted -- regulation costs, demand and supply -- therefore introducing new links between modernization and fertility. In their framework, all the determinants are seen as working through the three categories:
(i) The demand for children: the number of surviving children that parents would want if fertility regulation were costless.
(ii) The supply of children: the number of surviving children a couple would have if they made no deliberate attempt to limit family size.
(iii) The costs of fertility regulation.
In a pre-modern or early modern situation there is no motivation to limit fertility because the number of surviving children is below the demand for children. With the progress of modernization, the supply increases due to increased natural fertility and improved child survival, and results in the spread of deliberate fertility control, the cost of which declines as knowledge of methods expands.

The period fertility rates do not necessarily diminish, since the fertility-enhancing effects of raising natural fertility may offset the fertility-reducing effects of deliberate regulation, especially since the latter are typically concentrated among couples near the end of their reproduction careers. As a consequence, both total and unwanted fertility may continue to increase in the early transitional phase of the spread of deliberate control, although the increase is less than that which would have occurred in the absence of deliberate control. Eventually, however, the effect of growing control prevails and both total and unwanted fertility decline. It is also possible that fertility differentials by socio-economic status may reverse during the transition to deliberate control, shifting from positive to negative (or, alternatively, becoming more negative as the transition progresses) as natural fertility conditions that initially prevailed at all socio-economic levels are gradually replaced by deliberate fertility control. This replacement occurs first among the higher socio-economic groups. Furthermore, the schedule of marital fertility by age is likely to show a clockwise 'tilt,' if adoption of fertility control occurs first among those at older reproductive ages.

The framework recognizes education as the most pervasive factor influencing fertility control behavior relative to the influence of other factors such as rural-urban residence, occupational structure, and wives' work status before marriage. Contrary to the role of other factors (innovations in public health and medical care, urbanization, or the introduction of new goods), education in the Easterlin-Crimmins Framework operates on all three sets of the intervening variables, in the following way:
(a) On the supply of children: education delays age at marriage; breaks down traditional beliefs (e.g. post-partum and abstinence during lactation) and customs (e.g. long duration of breast-feeding) that had the effect of limiting fertility or spacing between births; it improves health condition by diffusing improved knowledge which lowers child and maternal mortality. Education leads to higher standard of childcare, with more emphasis on quality than quantity.
(b) On the demand for children: education shifts tastes in a way unfavorable to having many children and decreases the price of goods relative to children; it improves the income earning possibilities of women and thus increases the opportunity cost of the mother's childrearing time; it increases the relative cost of children by reducing the possible contribution of child labor to family income; it decreases the intensity of the

desire for children (associated with 'old good') relative to goods (new life styles put forward by education); it decreases preference for sons over daughters.
(c) In the costs and obstacles to contraceptive use: education lowers time costs with information on various means of fertility control; it alters cultural norms opposed to the use of fertility control; it increases spousal communication.
In sum, the Easterlin-Crimmins Framework suggests that education tends to raise natural fertility within marriage, because positive effects through reduced secondary sterility and breastfeeding tend to outweigh a negative effect from reduced child mortality. The positive effect of education on natural marital fertility, however, is considerably outweighed by its negative impact on duration of marriage, yielding reduced natural fertility overall among the more educated. In addition, when the positive effect of education on fertility control is considered, fertility is reduced even further. Education stimulates greater fertility control by increasing knowledge of methods of control and raising the motivation for control. Increased motivation occurs because female education reduces the demand for children as illustrated for example by the case of Colombia and Sri Lanka.
(3) The Caldwell framework: The work of Caldwell on 'wealth flows' stresses factors affecting the demand for children. In that framework, fertility decline began when there was a reversal of the net flow of resources from parents toward children, rather than from children to parents. This fundamental economic change is the result of social changes that concentrate greater family concern on the children. This theory is very close to the early work of Frank Notestein at Princeton University on the demographic transition, where it was stated that social and economic development would bring fertility down by changing the role of children and parents aspirations.

Caldwell's framework distinguishes between the primitive, traditional society, and the transitional society. In the primitive society, the largest organizational institution is the tribe, the clan, or the village. The minimization of risks is more important than the search for profit, and the society or economy is a single system. In such a system, high fertility is very rational, to increase the size of the security system. Extra children do not have an immediate impoverishing effect: under-use of resources is common in primitive societies and, moreover, children work and the patriarch of the family benefits economically and socially from a large number of children. Adult children assist their parents through their old age. In all primitive societies and in almost all traditional societies, the net flow is from child to parent.

In a transitional society, the attitudes towards children change mainly through the import of the western culture through two main vehicles: mass education and the mass media. Caldwell distinguishes between 'modernization' defined as that degree of social change that inevitably accompanies economic change because the new economic order demands it, and 'westernization' as the social change over and above that required by change in the economic order, that result from importing aspects of the Western way of life. Westernization may occur before or without modernization, meaning changes in fertility behaviors. The example of Sri Lanka, where fertility and mortality have both experienced substantial declines, has happened through westernization (of institutions, values, and aspirations) without a corresponding degree of economic modernization. The presence of mass education in a country will increase the impact of education on lowering fertility rates. In those countries, a small amount of education will be

associated with a decline in fertility. The introduction of mass education is just a sign of a changing society moving towards modernity in the western sense of the word (industrial, urban, monetarized economy with lower community childbearing norms).

The presence of mass education in the country will increase the impact of education on lowering fertility rates. In those countries, a small amount of education will be associated with a decline in fertility. This could have two reasons. One is that the introduction of mass education is just a sign of a changing society moving towards modernity in the western sense of the world (industrial, urban, monetarized economy with lower community childbearing norms). The process of fertility decline can be analyzed as the diffusion of new modes of life. The behavioral changes do not affect all population groups at the same time. The existence of substantial group differences in fertility may be temporary, and without profound theoretical significance. The segments of the population most exposed to new ideas, by reason of their education or geographical location, will adopt the 'new' fertility behavior at first. The second reason -- and this was proved by many multivariate analysis - is that education does have an impact on fertility even after other variables have been controlled for.

3. Education's Impact on Morbidity and Mortality

The social externalities associated with women's education go beyond that of fertility reduction as its impacts can also be found in nutrition, and children's heath and schooling. The input of the World Fertility Surveys in the study of mortality differentials and determinants in developing countries is extremely valuable. The major achievement of a few studies based mainly on WFS data was to clarify the negative influence of mother's education on child mortality, even when some other variables were introduced.

If the relation between fertility and education is complex, the relation between education and mortality is more linear. An examination of mortality for 1982 in developing countries showed the best predictors of low mortality were the proportions in school – especially the female proportions – a generation earlier, and the extent to which family planning is practiced. The examination of the high levels of correlation between maternal education and child survival is not to be proved any more. The United Nations estimated that child mortality is reduced 7 to 9 percent for every year of the mother's education.

4. Education and Development

There is increasing consensus in the international community that near-universal primary schooling is not only a prerequisite for the achievement of low fertility but, more importantly, an essential aspect of basic human development. The attention received by education culminated in 1994 at the Cairo International Conference on Population and Development where 180 countries acknowledged the importance of education for the wealth and well-being of individuals, families, and countries.

The emphasis on the relative productivity of physical capital dominated the literature of the 60s and 70s. Education was seen as a consumption good, with low returns of investment, and was supposedly diverting resources and having an adverse impact on economic growth, especially in the case of rapid population growth. In the 80s increased emphasis on the investment returns to human capital emerged, especially of the important positive externalities for economic growth associated with investments in human resources. Measures of educational attainment of populations have been important explanations of growth success, but more importantly education matters over and above its effect as an additional input to production; at the country and firm level, it is associated with higher total factor productivity; that is, with higher product with given inputs.
The literature has been suggesting that increasing the education of girls results in greater labor force participation of women and higher earnings. The primary education of both males and females has a strong positive effect on economic growth, and the effect of female education on economic growth seems higher than that for male education. At secondary level, the effect of the education of females and males is also positive but only significant for males' education.

The question is whether these positive social externalities associated with public and household investments in education would become negative in the case of rapid population growth. The demographic transition with continuous high birth rates and lowered mortality rates not only increases the absolute number of the population but also the proportion of the younger age groups in the total population. Many economists thought that the overall rise of school attendance in the developed countries after the end of World War Two had a perverse effect on the allocation of revenues. However, the predilection that expanding the coverage and levels of education would be impossible for most developing countries and would lessen economic growth underestimates the capacities of countries to respond to population growth. On average, developing countries have mostly kept pace with the absolute increase of the younger age cohorts in proving educational services, and even more in increasing the coverage of education, and the costs of this effort have not been particularly growth-inhibiting. The per-pupil expenditures increased in middle-income countries and decreased in low-income countries but population growth is not significant in explaining enrollment rates. Additionally, the proportion of school-age children to the total population was shown to have exerted no independent effect on the shares of GNP expended on education. If there is no direct impact of demography on the share of the GDP devoted to education, on the contrary the number of years of schooling is reduced when dependency rate increased. This could suggest that population growth impacts on attainment operate mainly through resource allocations within the education sectors.

5. Conclusion

Studies around the developing world have shown the negative statistical associations between education, and especially women's education, and fertility. Considerable research efforts have been made to determine whether education has a causal influence on fertility. This focus had the merit of broadening the debate from the education-fertility linkages and role of education in the demographic transition to more policy-

oriented issues such as human capital quality, levels of educational attainment through the society, and children's well-being. The studies found in general that school enrollment had a positive effect on both economic growth and social well-being (measured in terms of e.g. life expectancy, crude birth and death rates, child death rates, infant and maternal mortality rates, and total fertility rates). In general, reductions in birth and death rates are found when the proportion of primary and secondary school age increases, with the effect of secondary being stronger than that of primary. The impact of schooling is attenuated when differences in attendance between girls and boys are large. Countries will experience higher economic growth rates when they provide education for children, and secondary education has a stronger impact than primary, with the effect of gender differentials in education having modest effect on economic growth.
In 1995-2000, almost sixty percent of the world population increase was contributed by nine developing countries. In 1950, the women in those nine countries were having on average between six and seven children. In 1995-2000, in four of those countries this measure had fallen below three children; that is in Brazil, China, Indonesia and Mexico. In Bangladesh, India, Nigeria, Pakistan, and the Philippines, the TFR was ranging between 3.1 and 5.0.

Hence, the demographic transition is certainly under way, and is in the process of being completed for many developing countries. However, the momentum of the population accumulated by decades of important growth will take a long time to overcome. The world population size in the next years will depend mostly on the speed of the fertility decline. Eventually, this perspective is tied up with the educational participation in countries where educational attainment is currently low. The female participation in education will be crucial. Female enrollment lags behind male enrollment mostly in developing countries where already educational participation is low for both sexes. Therefore, the issue should not only be addressed as a problem of gender but also as a problem of scarcity of the resources allocated to educational development. These are mostly tied up with the prospects of development in general.

Glossary

Total fertility rate (TFR): measures the average number of children a woman would have at the end of her reproductive period if she had children according to the age specific fertility rates of all women in their reproductive years prevailing during that given period.
Literacy rate: Adult literacy rate is defined as the percentage of population aged 15 years and over who can both read and write with understanding a short simple statement on his/her everyday life.

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Biographical Sketch

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