Michal BAUER
Julie CHYTILOVÁ
Pavel STREBLOV[*]

EFFECTS OF EDUCATION ON DETERMINANTS OF HIGH DESIRED FERTILITY: EVIDENCE FROM UGANDAN VILLAGES

Abstract

High desired fertility is an important factor contributing to the population explosion in sub--Saharan Africa. On a broad sample of 910 respondents from rural areas of Uganda this paper assesses the impact of health risks, economic contributions from children, traditional community institutions and unequal position of women on desired fertility levels. The paper further scrutinizes how these determinants are affected by education.

The results show that fear of disease and involvement in traditional clan institutions increase the desired number of children. Interestingly, these effects can be remarkably mitigated through education, which improves individual health prevention as well as reduces the influence of clans. The economic incentives for having children seem to be less significant than other factors. In addition, a very significant difference in desired fertility between men and women emerges; nevertheless, education leads to both reduction and convergence of their desired fertility levels. All these findings suggest that education stimulates a complex change in fertility preferences and underline the importance of education as an efficient tool for reducing rapid population growth.

Keywords: fertility, education, development, demography

JEL classification: I1, I2, J1

1. Introduction and Hypotheses

Average fertility in the least developed countries (LDCs) has declined in the last 50 years from more than 6 to just under 3 children per woman. Fertility has declined most quickly in Latin America and Asia, from 5.9 to 2.6, and less rapidly in North

[*] IES, Charles University Prague
(michal.bauer@centrum.cz), (chytilov@seznam.cz), (streblov@hotmail.com)

Africa and Western Asia, from 6.6 to 3.5 children per woman (UNFPA, 2006), (Makinwa-Adebusoye, 2001). However, no such demographic transition has happened in sub-Saharan Africa. In the past 30 years, sub-Saharan Africa has become the region with the fastest population growth in the world. Despite high mortality levels caused by AIDS pandemics, the population more than doubled between 1975 and 2005, rising from 335 to 751 million (UNFPA, 2006). Currently, it is growing at a rate of 2.2 % a year (WDI, 2004). Furthermore, sub-Saharan Africa is the world's poorest region and was the only developing region to suffer a decline in per capita income during the period 1980–2000 (WDI, 2004). During this period, per capita income decreased on average by more than 1 percentage point annually.

During recent decades, a heated discussion has taken place on what causes fertility to decline and how it is linked to economic growth. Originally, the experience of rising living standards accompanied by decreasing birth rates in developed and successfully developing Asian and Latin American countries fostered an understanding of economic development as the best contraceptive. Summarizing the major conclusions of the World Population Conference held in 1974 in Bucharest, Finkle, and Crane (1975) wrote: "*the basis for an effective solution of population problems is, above all, socio-economic transformation*". This was taken to mean that economic growth would lead to a change in the rationale for having children and slow down population growth. Nevertheless, the challenge remains for those countries which are stuck in a situation of no growth accompanied by high fertility levels – sub-Saharan Africa being the prime example. When empirically analyzing the causes of high fertility rates, this paper builds on theoretical advances of the desired fertility approach (Easterlin, 1975), (Becker, 1991), (Pritchett, 1994), which emphasizes the importance of demand for children and suggests that high fertility is predominantly a result of people's choices.[1]

However, in the relevant literature there is no consensus on the relative importance of particular determinants of high desired fertility, and as Pritchett (1994) puts it: "*the key question is to what extent fertility desires are determined by economic influences and to what extent by social and cultural forces*". This is also the key question for the design of efficient policies that would enable sub-Saharan Africa to get out of poverty. A growing body of development researchers and institutions (e.g. (World Bank, 2005)) have emphasized the importance of education as a factor that affects desired fertility. But still, the specific pathways through which education influences these determinants are ambiguous in the existing research (see e.g. (Dreze, Murthi, 1999), or (Axinn, Barber, 2001)). It is the aim of this paper to contribute to this ongoing discussion by assessing the impact of key factors on the determination of individual desired fertility and to scrutinize how these factors are affected by education. The analysis will be based on a set of micro-level data collected from 910 participants in a questionnaire survey which we conducted in rural areas of Uganda.

The most frequently considered forces behind the high desired fertility in sub--Saharan Africa are the following. Children in rural areas may be regarded by parents

---

[1] For an alternative perspective emphasizing the supply side and arguing that the problem lies in a lack of contraceptives in developing countries, see e.g. (Robey, Rutstein, Morris, 1993) or (Westoff, Bankole, 2000).

as a net economic asset by providing household labor (Ntozi, Kabera, 1991). Moreover, the great majority of adults in sub-Saharan Africa, particularly in rural areas, are not covered by any social security system and rely on their children for economic support in old age and at times of need (Gille, 1985), (Merrick, 2002). Children in a poor health environment are more likely than other children to die. As a consequence parents have large numbers of children to compensate for this risk in the actuarial sense (Gille, 1985), (Sachs, 2004). Another group of determinants influencing desired fertility are cultural factors. Caldwell and Caldwell (1987) and Makinwa- -Adebusoye (2001) emphasize traditional community institutions that favor childbearing. These remain highly influential in many developing countries, bringing more prestige to those with more children. High fertility is associated with the right life, divine approval and approbation by both living and dead ancestors. The unequal position of women also plays a role. Mason and Taj (1987) discuss the impact of traditional patriarchal family systems. While men are the prime decision-makers about the number of children, day-to-day care is mostly the responsibility of the mother. This effect may be further reinforced by low opportunity costs of women (Becker, 1991).

The empirical research in this field is usually based on datasets from World Fertility Surveys (WFS) or Demographic and Health Surveys (DHS), which do not allow the relevance of the above-mentioned determinants perceived by individuals to be assessed. Some empirical studies at micro-level in sub-Saharan Africa and Uganda have aimed to solve this drawback. However, the majority of them do not focus directly on the determinants of desired fertility, but rather on the use of contraceptives and its effect on fertility rates (Ntozi, Kabera, 1991), (Kirk, Pillet, 1998).

Several specific effects of education on desired fertility have been identified. Firstly, besides changing attitudes or values it contributes to a reduction of the economic utility of children. Education increases the opportunity costs of parents' time and opens up greater opportunities for them as compared to investment in children as a productive asset (Weinberger, 1987), (Becker, 1991). Secondly, education may reduce infant and child mortality. Parents can therefore afford to plan fewer births in order to achieve a desired family size (Schultz, 1994), (Martín, 1995). Thirdly, the position of women improves with higher education, which could alter the decision-making process of the family on the number of children (Pritchett, 1994). Finally, educated people may be more receptive to modern social norms and the effect of traditional approaches might be mitigated (Caldwell, 1980). Weinberger (1987), Martín (1995) and Kravdal (2002) used the macro-level correlation between average education level and fertility rate to support the relationship. Kirk and Pillet (1998) made a similar analysis focusing on sub-Saharan African countries.

This paper will test the relevance of the above-mentioned determinants and the effects of education on an individual level. The hypotheses are the following:

- Health risks increase the desired number of children.
- Economic contributions from children to parents increase the desired number of children.
- Traditional Ugandan community institutions contribute to a higher desired number of children.
- The desired number of children differs for men and women.

- A higher level of education enhances prevention and reduces the risk of disease perceived by respondents.

- A higher level of education decreases the importance of children's economic contributions in fertility considerations.

- The influence of traditional community institutions (e.g. clans) decreases with the level of education.

- The position of the woman within the Ugandan family strengthens with the level of education she has.

2. Sample, Research Design and Major Variables

The questionnaire survey was conducted in ten villages in rural areas of the Mukono district (in the southern part of Uganda) under the auspices of the Institute of Economic Studies, Charles University in Prague and the Uganda Czech Development Trust. A total of 910 respondents participated in the study and all the questionnaires were completed in November 2005. The villages and respondents were selected so as to provide a varied sample in terms of level of education, age, sex, marital status and structure of economic activities. As 85 % of Ugandan inhabitants live in rural areas with similar characteristics, this sample should have relevance for the whole Uganda. Most of the respondents are farmers, and others are students, housewives, drivers, teachers, shopkeepers, etc. The distribution of the respondents in particular villages was the following: Kikube 105, Busagazi 42, Kateete 143, Buikwe 160, Nakifuma 47, Bweyogerere 95, Kasolo 89, Kygaya 58, Lugasa 122 and Kirugu 49. The questionnaires were bilingual – in English and Luganda – to allow us to approach less educated people who speak only Luganda.

Each respondent was asked to specify his/her desired number of children and the factors which are of utmost importance for his/her decision-making about number of children. The selected factors broadly cited in the desired fertility literature were "translated" into a language understandable to all the respondents in the following way. "Help of children now and their support when parents are old" was used as a proxy for the economic incentives behind high fertility. "Fear of child's fatal diseases" was used as a proxy for the high child mortality argument. The opportunity to "expand the size of respondent's clan" approximates the cultural factors.

Besides analyzing the factors affecting decision-making about number of children, we analyzed the impact of more general characteristics such as age, education level and sex. The sample was divided into five education levels: lower primary school (P1–P4), higher primary school (P5–P7), lower secondary school (S1–S2), higher secondary school (S3–S6) and above secondary school (diploma, bachelor degree or other university education). The average age of the respondents is 26 years. *Table 1* summarizes the frequencies of the different groups in the sample.

The advantages and disadvantages of this type of survey noted in the literature apply to this study as well. Nonetheless, the questions were examined carefully so as to limit as far as possible the risks connected with, for example, the respondents misunderstanding particular questions. There were three rounds of pre-testing with 10 representatives of the expected sample, based on which the questionnaires were adjusted. In cooperation with the Uganda Czech Development Trust, 30 local instruc-

TABLE 1 Descriptive Statistics: Total, by Sex and Age Group

	Total	Sex		Age groups				
		Man	**Woman**	**15–18**	**19–23**	**24–28**	**29–34**	**35–70**
Frequency								
N	910	496	414	280	188	150	105	181
Fraction in sample	100 %	55 %	45 %	31 %	21 %	17 %	12 %	20 %
Desired number of children (mean)	6.0	7.1	4.8	5.4	5.5	5.4	5.4	8.4
Education								
Fraction who completed P4	92 %	94 %	91 %	96 %	96 %	94 %	90 %	82 %
Fraction who completed P7	69 %	74 %	64 %	79 %	79 %	71 %	65 %	46 %
Fraction who completed S2	48 %	51 %	45 %	36 %	69 %	63 %	53 %	31 %
Fraction who completed S6	7 %	8 %	6 %	0 %	3 %	18 %	23 %	4 %
Age (mean)	26	27	26	16	21	26	31	44
Family and society embeddedness								
Single	510	287	223	266	150	62	11	15
Married or divorced	400	209	191	14	38	88	94	166
Respondents with strong clan linkage	177	132	45	47	33	23	14	59

tors well respected in the community were trained. The instructors not only helped with the distribution and return of the questionnaires, but also approached the respondents individually. Their social status ensured openness and a serious approach on the part of the respondents. Therefore, we believe that the respondents were positively motivated to complete the questionnaire with the necessary care and diligence.
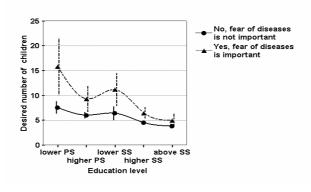
3. Statistical Results

3.1 Health Risks

Uganda has one of the highest fertility rates in the world. The actual fertility rate in Uganda is 6.1 per woman (WDI, 2004). The mean desired fertility in our sample is 6.0. It is not the prime focus of this paper to analyze the difference between actual and desired fertility levels, but this comparison indicates that the actual number of children largely reflects the people's desires.

Mortality of children under 5 years in Uganda is 14 %. In sub-Saharan Africa as a whole the average is 17 %, whereas in the OECD countries it is 0.6 % (WDI, 2004). The responses from our sample indicate that fear of child mortality contributes to higher desired fertility levels. Respondents for whom the fear of disease was of utmost importance want to have 9.8 children on average, whereas the mean for people without such a strong fear of disease is 5.4. According to the ANOVA test of mean stability the difference is significant at the 1% level.

Figure 1 suggests two interesting outcomes. Firstly, education decreases desired fertility for both groups. Secondly, a perception of a poor health environment and higher

FIGURE 1 Desired Number of Children, Fear of Disease and Education Levels

Note: The fugures depict average values for particular groups and 95% confidence intervals.
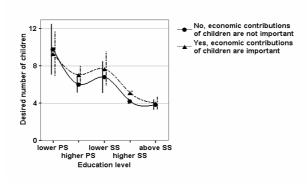
child mortality increases desired fertility for all education levels. However, the difference in desired fertility between the groups tends to diminish with increasing education level. The effect of education is further reinforced by change in the proportion of respondents fearing disease, which diminishes by 15 percentage points at secondary school level.

These outcomes can be attributed to the link between education and attitude to health prevention. There is considerable evidence, surveyed and contributed to by Mirowsky and Ross (1998), suggesting that changes in high mortality risks are symptomatic of higher levels of education, which encourage the adoption of a healthy lifestyle. Malaria is responsible for a huge proportion of early mortality, and the risk of infection by this disease is very closely linked with individual prevention, especially the use of mosquito nets (Gyapong et al., 1996), (Choi et al., 1995). To examine the link between education and health prevention, the Ugandan respondents were asked if they use a mosquito net. The results indicate that the share of people who use a mosquito net increases for each level of education. Only 25 % of respondents with lower primary school education use a net, in contrast to 67 % of those with completed secondary school education. This finding is in line with the empirical study of Nuwaha (2001) on mosquito net use, which was also undertaken in Uganda. Education of parents can therefore be viewed as a factor that limits the risk of a child being infected by malaria. Consequently, more educated parents do not need to insure so much against high child mortality in the form of additional children.

3.2 Economic Contributions from Children

In rural areas such as the Mukono region, where most income has its origin in subsistence farming, children might be perceived as a source of labor. Additionally, as in most other sub-Saharan countries, a social security system is almost absent in Uganda (Reinikka, Collier, 2001) and people do not have any guaranteed social minimum as in developed countries. For many Ugandans, children are their only security for old age or bad health. The respondents' answers from our sample do not provide

FIGURE 2 Desired Number of Children, Importance of Economic Support and Education Levels

a clear picture of the relevance of economic contributions from children to higher desired fertility. On the one hand, a large proportion of the respondents (59 %) claimed that support from children is an important factor in their fertility decision-making. On the other hand, there are no significant differences in the means of desired fertility between the group that highly appreciates children's economic support (6.5 children) and the group that considers this factor to be unimportant (5.4 children). At the 5% level we cannot reject the hypothesis that the means are the same for both groups (ANOVA test).

The possibility of a child providing economic support to parents does not make a big difference in desired fertility for any education level (*Figure 2*). This finding contrasts with the argument of Weinberger (1987) and Kravdal (2002), who claim that education significantly reduces the economic utility of children and consequently pushes down the desired number of children. Our data suggest a rather weak link between education and desired fertility through the changing perception of child as an economic asset.

3.3 Traditional Community Institutions

According to Makinwa-Adebusoye (2001:6), in African clan-based rural societies there is a need to ensure that the fertility level is well above the mortality level and the clan thus will not disappear. "*Considerable expansion of membership enhances the power and prestige of the clan and reduces the likelihood of extinction through death.*" Therefore, clan leaders exert pressure on clan members to contribute personally to the growth of the clan population by having a higher number of children. Especially for men, social status in traditional Ugandan society is thus closely tied up with the number children they have.

The data confirm that being embedded within the informal institutions of a clan very strongly increases the desired number of children. People with a strong clan linkage desire to have 10.5 children on average, whereas those with a weak clan linkage desire to have only 4.9 children (ANOVA significant at the 1% level). Clan linkage also increases desired fertility for each education level (see *Figure 3*). However, the difference between the groups with strong and weak clan linkage is not

FIGURE 3 Desired Number of Children, Importance of Clan and Education Levels
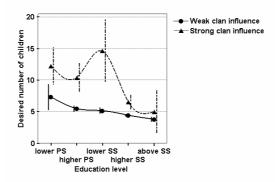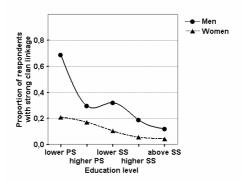

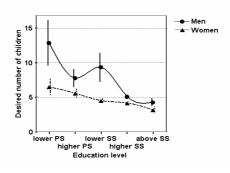FIGURE 4 Proportion of People with Strong Clan Linkage and Education Levels

stable. The desired fertility of respondents with a weak clan linkage steadily decreases with education. Interestingly, people with a strong clan linkage want to have more than 8 children until the first half of secondary school. Their fertility preferences tend to change very rapidly in the second half of secondary school, where the number of children decreases to 5. People with a strong clan linkage seem to resist the effect of education until a higher level of secondary education.

Furthermore, the largest proportion of people with strong clan loyalty have completed less than the first half of primary school. This proportion is even higher in the case of uneducated men (69 %, see *Figure 4*), as the traditional system of clans is predominantly masculine. Education very rapidly decreases the influence of the clan by reducing the proportion of people with a strong clan linkage. The proportion of men with a strong clan linkage decreases by 40 percentage points during higher primary school.

To the knowledge of the authors, the existing fertility studies do not offer any quantitative support for the link between desired fertility and traditional community structures. Our data suggest a strong positive relationship between clan loyalty and

FIGURE 5   Desired Number Desired Children, Sex And Education Levels

desired fertility and show that education has the capacity to eliminate the influence of the clan on fertility decisions.

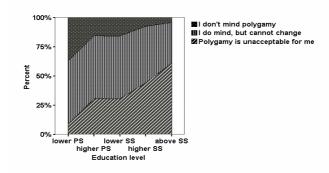### 3.4 Sex and Unequal Position of Women

The literature on differences in desired fertility between men and women in developing countries is ambiguous. Bankole and Singh (1998) show on DHS data collected in developing countries between 1990 and 1996 that both men and women want to have large families and that husbands want more children than their wives. This is because it is women who take full care of children in traditional societies and thus want less of them. In their survey article Mason and Taj (1987) analyze a variety of channels for women's desired fertility to be either lower or higher than men's. Higher desired fertility of women under patriarchal systems may arise due to their effort to insure against the risk of divorce.

Our research results support the view that women want to have less children than men. Men want to have 7.0 children on average, whereas women want only 4.8. The difference is significant at the 1% level (ANOVA test).

Several authors show an overall pattern of decreasing women's desired fertility with increasing education. Martín (1995) in her study based on DHS provides an indicator of mean ideal family size according to women's education for 26 developing countries, including 10 sub-Saharan countries. For Uganda, the results suggest that women with no education want to have 7.2 children on average, and this number decreases with education to 5.1 for the most educated women. Similarly, Kirk and Pillet (1998:12) show that in the group of sub-Saharan countries with the highest fertility rates, which includes Uganda, desired fertility falls from 6.2 for women with no education to 4.0 for women with secondary education. Our data (the lower line in *Figure 5*) are in line with these observations. Women's desired fertility decreases for all levels of education – from an average of 6.8 for women having finished less than the first half of primary school to 4.2 for those with higher secondary school education.

The relevant studies do not systematically account for possible differences between the desired fertility of men and women. The focus is on women's desired fertility; for example, WFS relied almost exclusively on the reports of women. As mentioned earlier, due to a number of socio-cultural factors women are very often

FIGURE 6 Women's Attitude to Polygamy and Education Levels

voiceless and powerless in matters affecting their reproduction and men are dominant decision-makers on fertility in many African countries (Makinwa-Adebusoye, 2001).

The upper line in *Figure 5* depicts the desired number of children for men across education levels. It shows that education changes the fertility preferences of men more considerably than those of women. Uneducated men want to have more than 12 children, whereas men with higher secondary school education want to have only 5.1 children. These data outcomes, together with the strong position of men in Ugandan society, highlight the provision of education to men as a critical measure for reducing high fertility rates.

On the other hand the position of the woman within the family alters with the level of education she has. The women in our sample were asked to what extent polygamy of their husbands is or is not acceptable to them. *Figure 6* shows the results. Polygamy is noticeably less acceptable to educated women in comparison with women having almost no education. Unacceptability of polygamy increases from 10 % to almost 50 %.
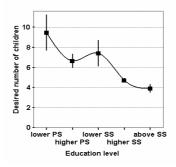
The data suggest three interesting findings resulting from sex differences. Firstly, men want to have more children than women. Secondly, education has a stronger impact on a man's fertility choices than on a woman's; this is especially important in the context of the patriarchal society in Uganda. Thirdly, education strengthens the position of the woman within the family, which may reinforce the effect of education on lower desired fertility.

3.5 Total Effect of Education

The results from the Ugandan survey strongly accord with the view that education has a significant negative impact on desired fertility.[2] The relationship between these two variables is depicted in *Figure 7*. We can observe a rapid decline in desired fertility at lower primary school; a further significant decline appears at secondary school. The average desired number of children decreases from 9.5 to 6.5 at primary school and further to 4.1 at secondary school.

The inverse relationship between desired fertility and education is well established. Less clear is the magnitude and pathways through which education influences desired fertility. As mentioned above, according to Martín (1995) and Kirk and Pillet

FIGURE 7 Desired Number of Children and Education Levels

(1998), uneducated Ugandans want to have two more children on average than the most educated ones. We observed a stronger impact of education – a difference of five children. However if we used data for women only, as the referenced studies did, similar results would be obtained. Since the role of men in the decision-making process on the number of children is strong, it is important also to take into account their desired fertility when measuring the magnitude of the education effect.

The types of observed effects of education are summarized in *Table 2*. Firstly, education decreases the fear of disease due to an improvement in prevention, and so parents do not tend to desire additional children as insurance against a child's death. Secondly, the economic influences are lower for more educated parents, as they rely more on themselves in old age or at times of need. However, this effect emerged as less significant when compared to other factors. Thirdly, the influence of traditional community institutions that favor childbearing is moderated by higher education. Finally the unequal position of women improves with higher education; this can be shown on women's attitude to polygamy. As a consequence of a better position in the household, a woman's preferences about number of children, which are lower in general than those of men, may be more respected. Education thus mitigates the importance of all four factors that were identified as contributing to the high desired fertility level in Uganda.

4. Econometric Results

The preceding statistical analysis demonstrates the impact on desired fertility of three factors: fear of disease, clan linkage, and sex. Economic support of children

---

[2] A number of empirical studies warn against overestimating the effects of education on the outcomes of interest when one relies solely on the correlation between the two variables. This may arise due to the omission of unobserved abilities correlated with education (in the context of fertility see (Breierova, Duflo, 2002)). To address the omitted variable bias, the level of education is usually instrumented by the exogenous accessibility of education. We have used varying frequency of education facilities in different villages and the exposure of the respondents to the Ugandan education reform of 1996 as instrumental variables for education. According to our 2SLS estimates an additional year of schooling decreases the desired number of children by 0.4–0.8 and is significant at 1% level. Hence the results are in line with the proposition that there is indeed a causal effect of education on desired fertility.

TABLE 2 Effects of Education on Desired Fertility: Summary

Factors behind desired fertility	Impact on desired fertility	Impact of education on importance of factor	Impact of education on desired fertility
Fear of disease	+	-	**-**
Economic help of children (insignif.)	+	-	**-**
Clan linkage	+	-	**-**
Sex and unequal position of women	+	-	**-**

TABLE 3 Determinants of Desired Fertility. OLS estimates (*t*-statistics in parenthesis) for whole sample.

	Whole sample	
	$R^2 = 0.21$	Adj. $R^2 = 0.20$
Intercept	5.84***	(9.59)
Fear of diseases (important = 1)	3.03***	(6.03)
Child's support (important = 1)	1.32***	(3.77)
Clan linkage (important = 1)	4.71***	(10.37)
Sex (man = 1, woman = 2)	-1.36***	(-3.84)

Notes: Dependent variable: Desired fertility
   *   Indicates statistical significance at the 10% level.
   **   Indicates statistical significance at the 5% level.
   *** Indicates statistical significance at the 1% level.

seemed to be positively correlated, but insignificant. The regression analysis reported below tests the hypotheses jointly and controls for the effects of other particular factors. OLS estimation was used to analyze the data, assuming a normally distributed error term.

In regression form we can model the hypotheses in the following way:

$$F = b_0 + b_1 D + b_2 H + b_3 C + b_4 S + e \qquad (1)$$

where F = desired fertility, D = fear of disease, H = economic help of children, C = = clan linkage, and S = sex. *B*'s are the OLS coefficients, and *e* is the error term. The hypotheses are the following: $b_1 > 0$, $b_2 = 0$, $b_3 > 0$ and $b_4 < 0$. *Table 3* presents the econometric results for the whole sample. *R* Square is equal to 0.21 and the significance level is below 1 %.

The findings re-establish the impact of the above-analyzed factors on desired fertility.[3] In contrast to statistical testing, the results of the overall regression suggest that the positive impact of a child's economic support is significant at the 1% level.

The sample was divided into the more educated half and less educated half of the respondents in order to compare the coefficients for the two sub-samples (see *Table 4*). The coefficients of the explanatory variables show lower slopes for the educat-

---

[3] To deal with the fixed effects of the specific villages where the data were collected we also included clustering in the OLS regression. The resulting standard errors and significance levels did not emerge substantially altered from those of simple OLS in *Table 3*.

TABLE 4 Determinants of Desired Fertility. OLS Estimates (t-statistics in parenthesis) for More Educated and Less Educated Half of Respondents

	Education			
	Less educated half		**More educated half**	
	$R^2 = 0.22$	**Adj $R^2 = 0.22$**	**$R^2 = 0.18$**	**Adj Rsq = 0.17**
Intercept	8.21***	(7.23)	4.52***	(12.84)
Fear of diseases (important = 1)	3.24***	(4.07)	1.55***	(4.29)
Child's support (important = 1)	1.27**	(1.98)	0.95***	(4.66)
Clan linkage (important = 1)	5.54***	(7.48)	1.71***	(5.44)
Sex (man = 1, woman = 2)	-2.55***	(-4.02)	-0.56***	(-2.68)

TABLE 5 Determinants of Desired Fertility. OLS Estimates (*t*-statistics in parenthesis) for Sub-Samples Divided According to Importance of Fear of Disease ond Child's Support

	Diseases				Child's support			
	Unimportant		**Important**		**Unimportant**		**Important**	
	$R^2 = 0.13$	**Adj $R^2 = 0.12$**	**$R^2 = 0.22$**	**Adj $R^2 = 0.21$**	**$R^2 = 0.26$**	**Adj $R^2 = 0.25$**	**$R^2 = 0.19$**	**Adj $R^2 = 0.18$**
Intercept	5.54***	(9.59)	11.07***	(4.64)	5.73***	(8.89)	7.22***	(8.53)
Fear of diseases (important = 1)					2.37***	(4.40)	3.48***	(4.40)
Child's support (important = 1)	1.09***	(3.22)	2.14	(1.56)				
Clan linkage (important = 1)	4.17***	(9.04)	6.03***	(4.31)	4.16***	(8.56)	5.09***	(7.09)
Sex (man = 1, woman = 2)	-1.00***	(-2.97)	-3.71**	(-2.60)	-1.13***	(-2.83)	-1.49***	(-2.81)

TABLE 6 Determinants of Desired Fertility. OLS Estimates (*t*-statistics in parenthesis) for Sub-Samples Divided According to Importance of Clan Linkage and Sex.

	Clan linkage				Sex			
	Weak		**Strong**		**Men**		**Women**	
	$R^2 = 0.10$	**Adj $R^2 = 0.09$**	**$R^2 = 0.08$**	**Adj $R^2 = 0.06$**	**$R^2 = 0.19$**	**Adj $R^2 = 0.19$**	**$R^2 = 0.20$**	**Adj $R^2 = 0.19$**
Intercept	5.49***	(15.09)	12.54***	(4.86)	3.98***	(7.77)	3.78***	(19.13)
Fear of diseases (important = 1)	2.10***	(6.05)	4.54***	(2.76)	4.05***	(4.97)	1.38***	(3.66)
Child's support (important = 1)	1.03***	(4.76)	1.97	(1.27)	1.60***	(2.66)	0.86***	(3.55)
Clan linkage (important = 1)					5.32***	(7.71)	3.06***	(7.87)
Sex (man = 1, woman = 2)	-0.94***	(-4.46)	-3.60**	(-2.05)				

ed half of the respondents than for the less educated half (differences significant at the 1% level). These results comply with the hypothesis that education mitigates the effect of all analyzed determinants of high fertility and thus contributes to a reduction of

desired fertility. In addition, the intercept for the more educated half is lower by almost 3.8 children.

Besides the regression model in equation (1) we ran a series of OLS regressions for different sub-samples to observe how the variables interact. The slopes for the different sub-samples are given in *Table 5* and *Table 6*.

Three observations from this analysis are worth noting. Firstly, the fertility decision-making of the respondents who perceive one factor as important for number of children is in general more affected by other determinants as well. For example, people with a strong clan linkage reflect fear of disease more strongly in their desired number of children than people with a weak linkage. Secondly, all the intercepts are substantially higher for the groups perceiving particular factors with higher importance. Thirdly, men and women have similar intercepts, but men have higher coefficients of all determinants than women.

5. Conclusions

The rapid population growth in sub-Saharan Africa is one of the critical forces that undermine the region's economic growth prospects. The region would have to grow by more than 2.2 % annually just to keep living standards at the same level, not to mention convergence to more developed countries. There is a substantial literature on the possible causes of high desired fertility in poor countries. We have classified these factors into four broad types: health risks, economic contributions from children, traditional community institutions, and unequal position of women in society. The usually observed correlation between education and fertility based on aggregate data does not allow one to assess if and to what extent the importance of these factors changes with education. In contrast to most existing studies this paper analyzes more detailed individual-level data from a questionnaire survey among 910 respondents from villages in the Mukono district, Uganda. The key results of the research are quantification of the influence of particular factors on desired number of children, and decomposition of the impact of education.

The average desired number of children in the sample amounts to 6.0, which is almost identical to the actual fertility rate in Uganda, which is 6.1 children per woman. We have found that fear of disease motivates respondents to desire a higher number of children. The results also suggest that more educated people put a higher emphasis on prevention and reduction of health risks, as measured by mosquito net use. As a consequence, more educated respondents attributed a substantially lower importance to health risks in their fertility decisions than their less educated counterparts, and their final desired number of children was lower.

The data draw attention to the fact that the traditional community institution – the clan – may substantially increase the desired number of children, on average by as much as 5.6 children. At the same time, the data provide rare quantitative support for the role of education in reducing clan influence on fertility. This effect takes place at both primary and secondary level education.

Another interesting finding stems from the analysis of the different fertility preferences of men and women. The decline in desired fertility of women due to education shows a similar pattern in our sample as in other comparable studies measuring the impact of education on fertility. However, these studies predominantly

consider women's fertility preferences as decisive and often omit the role of men. A remarkably high impact of education on men's desired fertility suggests that education of men is equally important as that of women.

Economic contributions of children emerged as important for the majority of the respondents, but statistical tests did not provide a clear picture of the significance of this factor in altering desired fertility.

In general, it seems that there is not just one specific pathway through which education influences the desired number of children, as is often assumed. Rather, the responses indicate that education stimulates a complex change in preferences and fertility attitudes. The change in the perceptions of the respondents ranges from health and economic effects to the cultural influences underlying high desired fertility. We hope that our findings provide a clearer picture of why education should be considered the most appropriate contraceptive and why foreign aid focusing on mitigating rapid population growth should take the form of widespread education provision to secondary level, equally available for women and men.

REFERENCES

Axinn WG, Barber JS (2001): Mass Education and Fertility Transition. *American Sociological Review*, 66:481–505.

Bankole A, Singh S (1998): Couples' Fertility and Contraceptive Decision-Making in Developing Countries: Hearing the Man's Voice. *International Family Planning Perspectives*, 24(1):15–24.

Becker GS (1991): *A Treatise on the Family*. London, Harvard University Press.

Breierova L, Duflo E (2002): The Impact of Education on Fertility and Child Mortality: Do Fathers Really Matter Less Than Mothers? *NBER Working Paper*, 10513 [online]. Available from: http://www.nber.org/papers/W10513 [Accessed 24 August 2006].

Caldwell JC (1980): Mass Education as a Determinant of the Timing of Fertility Decline. *Population and Development Review*, 6(2):225–255.

Caldwell JC, Caldwell P (1987): The Cultural Context of High Fertility in Sub-Saharan Africa. *Population and Development Review*, 13(3):409–437.

Choi HW et al. (1995): The Effectiveness of Insecticide-impregnated Bed Nets in Reducing Cases of Malaria Infection: A Meta-analysis of Published Results. *American Journal of Tropical Medicine and Hygiene*, 52(5):377–382.

Dreze J, Murthi M (2001): Fertility, Education and Development: Evidence from India. *Population and Development Review*, 27(1):33–63.

Easterlin RA (1975): An Economic Framework for Fertility Analysis. Studies in Family Planning, 6(3):54–63.

Finkle JL, Crane BB (1975): The Politics of Bucharest: Population, Development, and the New International Economic Order. *Population and Development Review*, 1(1):87–114.

Gille H (1985): The World Fertility Survey: Policy Implications for Developing Countries. *International Family Planning Perspectives*, 11(1):9–17.

Gyapong JO et al. (1996): Rapid Community Diagnosis of Lymphatic Filariasis. *Acta Tropica*, 61:65–74.

Kirk D, Pillet B (1998): Fertility Levels, Trends, and Differentials in Sub-Saharan Africa in the 1980s and 1990s. *Studies in Family Planning*, 29(1):1–22.

Kravdal O (2002): Education and Fertility in Sub-Saharan Africa: Individual and Community Effects. *Demography*, 39(2):233–250.

Makinwa-Adebusoye P (2001): *Sociocultural Factors Affecting Fertility in Sub-Saharan Africa.* Workshop on Prospects for Fertility Decline in High Fertility Countries, July 2001, United Nations Population Division.

Martín TC (1995): Women's Education and Fertility: Results from 26 Demographic and Health Surveys. *Studies in Family Planning*, 26(4):187–202.

Mason KO, Taj AM (1987): Differences between Women's and Men's Reproductive Goals in Developing Countries. *Population and Development Review*, 13(4):611–638.

Merrick TW (2002): Population and Poverty: New Views on an Old Controversy. *International Family Planning Perspectives*, 28(1):41–46.

Mirowsky J, Ross CE (1998): Education, Personal Control, Lifestyle and Health – A Human Capital Hypothesis. *Research on Ageing*, 20:415–449.

Ntozi JPM, Kabera JB (1991): Family Planning in Rural Uganda: Knowledge and Use of Modern and Traditional Methods in Ankole. *Studies in Family Planning*, 22(2):116–123.

Nuwaha F (2001): Factors Influencing the Use of Bed Nets in Mbarara Municipality in Uganda. *American Journal of Tropical Medicine and Hygiene*, 65:877–882.

Pritchett LH (1994): Desired Fertility and the Impact of Population Policies. *Population and Development Review*, 20(1):1–55.

Reinikka R, Collier P (2001): *Uganda's Recovery: The Role of Farms, Firms and Government*. Washington, D.C.: World Bank.

Robey B, Rutstein SO, Morris L (1993): The Fertility Decline in Developing Countries. *Scientific American*, 269(6):60–66.

Sachs J et al. (2004): Ending Africa's Poverty Trap. *Brookings Papers on Economic Activity*, 1:117–240.

Schultz TP (1994): Human Capital, Family Planning, and Their Effects on Population Growth. *American Economic Review*, 84(2):255–260.

United Nations Population Fund (UNFPA) (2006): *Annual Report 2005*. New York.

United Nations (2004): *World Development Indicators*. New York.

Weinberger MB (1987): The Relationship Between Women's Education and Fertility: Selected Findings from the World Fertility Surveys. *International Family Planning Perspectives*, 13(2):35–46.

Westoff CF, Bankole A (2000): Trends in the Demand for Family Limitation in Developing Countries. *International Family Planning Perspectives*, 26(2):56–62.

World Bank (2005): *Opening Doors – Education and the World Bank* [online]. Available from: http://www1.worldbank.org/education/pdf/OpenDoors.pdf [Accessed 24 August 2006].