Fertility Transition in Francophone Sub-Saharan Africa: Stagnation

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Abstract

Fertility transition has been well underway in Sub-Saharan Africa. The total fertility rate dropped from 6.8 in 1970-75 to 5.5 by 2000-2005. The author's earlier study indicated that there would be two major fertility decline patterns in Sub-Saharan Africa, based on cultural groupings and official language zones. The fertility decline pattern in Francophone countries in particular could be distinguished by its later onset and slower pace, compared with that of Anglophone counterparts largely due to the French colonial legacy and neo-colonial influence.

This study compared fertility outcomes in the recent past (1986-2005) of the two language zones with DHS data in order to examine the fertility patterns and its change over time. The results of the analysis indicated that there exists the fertility difference between the two groups, even after controlling for the effects of socio-economic variables. We, however, believe that this difference will disappear with time as fertility transitions of both groups advance with the integration of modern socio-economic life style into their culture and in particular with the propagation of the modern educational system in Africa.

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The views expressed herein are those of author and do not necessarily reflect the views of UNFPA or United Nations.

Introduction

Overall fertility transition in Sub-Saharan Africa has been well underway since at least the mid-1990s, or some researchers even contended that it started in the mid-1980s depending on the criteria that they measured. In the early 1990s, scholars questioned the validity of this statement and research findings, and most of them were rather cautious to accept the onset of fertility transition in the region. However, with the increased availability of fertility data and subsequent research findings, the onset of the fertility transition in Sub-Saharan Africa became a sheer fact by the late 1990s for most researchers as well as for policymakers in the international community. According to the recent estimates, the total fertility rate in Sub-Saharan Africa dropped from 6.8 in the 1970-75 period to 5.5 by the 2000-2005 period (UNDP, 2007), even though it still remains to be the highest among the developing regions (Table 1). In fact, TFR for the developing countries dropped from 5.4 to 2.9 after three decades and this was largely led by East Asia and the Pacific (from 5.0 to 1.9), Latin America and the Caribbean (from 5.0 to 2.5) and South Asia (from 5.5 to 3.2).

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There are, however, variations in the timing and pace of the fertility decline among countries in Sub-Saharan Africa. In fact, one of the often cited variations for the type of fertility transition at the macro level is geographical. Western and Central African regions have been often characterized as relatively more resistant to the control of fertility. Eastern and Southern African regions, on the other hand, were perceived to be in the forefront on the initiation of new fertility regime. This over-simplified geographical difference, however, has not been sufficiently explained by concrete theories or reasons behind the phenomenon. This observation was particularly evident with the demonstration of research findings, for example, for Botswana, Kenya, South Africa[2] and Zimbabwe where the fertility started to fall by the late 1980s (Caldwell et al., 1992; Lesthaeghe and Jolly, 1995; Robinson, 1992; Rutenberg and Diamond, 1993; Thomas and Muvandi, 1994). We, however, note that not all countries in Eastern and Southern Africa showed clear evidence on the onset of fertility decline. The declines of Burundi, Rwanda, Tanzania and Uganda in Eastern Africa were timid and those of Madagascar, Malawi and Zambia in Southern Africa were equally inconclusive in the 1990s.

An alternative view on the analysis of fertility decline pattern is to look at historical context of the region and analyze the trends with the categorization of countries by the use of official language. The majority of the Sub-Saharan African countries[3] were

[2] The fertility of black African population began to fall in the 1960s but significant falls were registered in the 1970s and 1980s with South African government's intense family planning programmes (Potts and Marks, 2001).

[3] Island countries in the Indian Ocean (Mauritius, Seychelles) are excluded from the analysis in this study due to small number of population and their relatively minor influence on the results of the analysis. Other countries not included in the analysis are former Portuguese colonies (Angola, Cape Verde, Guinea Bissau,

colonized by France (16 countries[4]), Belgium (3 countries[5]) and the United Kingdom (16 countries[6]), thus are inheriting French and English as their official languages. This type of grouping can be intuitively more convincing, as the influence of former European colonizers in modern Africa has been widespread over the political and socio-economic structure of the former colonies. In particular, French influence toward its former colonies is considered to be stronger. France was largely characterized by its assimilation policy which intended to integrate African colonies into French culture and family through the transmission and diffusion of the French culture and language and with the cultural transformation of Francophone Africa (Manning, 1988; White, 1985). The official language based grouping is more convincing if we look at the penetration of modern educational system in Africa, as the education is one of the most effective mediums to convey cultural influences. However, if this is the case, rural and non educated group is the least influenced population from European colonizer's culture, especially before the propagation of mass education. Thus, the country based aggregated analysis is one measure to compare but individually based aggregation by educated population is another measure to consider in the future analysis. As an illustration, table 2 shows the evolution of gross primary school enrollment rates between Francophone and Anglophone countries in Africa for the period 1970-2005.

"Table 2 here"

By 1985, the average primary gross enrollment rate for Anglophone countries showed marked progress by reaching 89 per cent for boys and girls combined and 87 per cent for girls, whereas the progress of the average rate for Francophone countries was rather timid with 71 percent for boys and girls combined and 60 per cent for girls. In 2005, the averages rates for Anglophone countries were 106 per cent for boys and girls combined and 104 per cent for girls, whereas those of Francophone countries were 90 per cent for boys and girls combined and 83 per cent for girls. In sum, roughly speaking, throughout the period in study with DHS (1986-2005) differences in educational attainment, measured by primary school enrollment rates, seem to exist between Francophone and Anglophone countries.

Next, we note the importance of French religious influence. The African population was massively converted to Catholic with the influence of French

Mozambique, Sao Tome and Principe), former Spanish colony (Equatorial Guinea) and non colonized countries (Eritrea, Ethiopia).

[4] Benin, Burkina Faso, Cameroun (Part of Cameroun was colonized by Britain after the First World War, thus today two provinces of Cameroun are using English as one of the official languages of the country. However, as the French influence is more predominant for the country's culture, it is categorized here nominally as French former colony. In the analysis, where possible, English-speaking population will be analyzed separately from French-speaking population.), Central African Republic, Chad, Comoros, Republic of the Congo, Cote d'Ivoire, Gabon, Guinea, Madagascar, Mali, Mauritania, Niger, Senegal, Togo

[5] Burundi, Democratic Republic of the Congo, Rwanda

[6] Botswana, Gambia, Ghana, Kenya, Lesotho, Liberia, Malawi, Namibia, Nigeria, Sierra Leone, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe

missionaries (Manning, 1988). Table 3 shows the latest religious prevalence in Francophone and Anglophone countries in study.

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Today, Catholic is predominant in 10 (Benin, Burundi, Cameroun, Central African Republic, Republic of the Congo, Democratic Republic of the Congo, Gabon, Madagascar, Rwanda, Togo) out of 19 French-Speaking countries. The penetration of Islam in Africa is also important because centuries of Muslim missionary efforts have led to the development of significant Muslim communities in Francophone Africa. Manning (1988) noted that by 1985 nearly 50 per cent of population in Francophone Africa had become Muslim. Today, Islam is predominant in 9 (Burkina Faso, Chad, Comoros, Cote d'Ivoire, Guinea, Mali, Mauritania, Niger, Senegal) out of 19 French-speaking countries. Christian missionaries were largely led by Europeans and sometimes received violent rejection from Africans while Muslim missionaries were largely led by Africans. The implication is that Christian missionaries were perceived to be associated with colonization while Muslim missionaries were considered to be associated with other types of cultural interaction, such as trading and political influence. Both Christian and Muslim missionaries used schools as a way of converting the religions of local population.

In sum, French administrative, fiscal, judicial and educational systems were installed into African countries and this has led to quasi-total cultural dependency. In particular, education and language are the main mediums to reinforce France's cultural influence and this can even be translated into some behavioral changes (Martin, 1985). The French emphasized the development of French-speaking African elites, while the British allowed African languages to become literary languages, and the Belgians emphasized widespread primary education in African languages (Manning, 1988).

One of the examples on language group difference is the author's earlier study (Ohashi, 2001) which examined the shift in the perceptions of African governments on population growth and fertility levels since the 1970s and found the existence of a large gap between Francophone and Anglophone countries. For Francophone countries the change in governmental positions towards the neo-Malthusian idea of curbing population growth with family planning and contraceptive methods started to be socially accepted much later, at least a decade or so, compared with Anglophone counterparts. In fact, some scholars (Sala-Diakanda, 1990; Makinwa, 1993) pointed out that French-speaking, Portuguese-speaking and Spanish-speaking countries had higher fertility levels due to colonial legacy as those European colonizers of Latin origin/culture are more resistant in accepting the new concept of fertility control that emerged in the 20th century especially because those countries are traditionally more dominated by catholic and Islamic doctrines both of which highly value the family and children.

In sum, this study will review the recent evolution of fertility in Sub-Saharan Africa with a particular focus on the modern language influence on African countries and its possible transmission of colonizers' cultural values and ideas on pro-natal positions and behaviors, especially those of France, vis-à-vis inherent African culture. In the

analysis, major Sub-Saharan African countries will be categorized between French-speaking and English-speaking countries and the influence of family planning programmes and contraception on fertility will be analyzed in order to examine the group difference between them since the mid 1980s with the available demographic and health survey (DHS) data. We should note, however, that this is just an experimental attempt to measure the probable cultural differences empirically with the use of individual based demographic data. Therefore, this study is subject to any criticism that can be linked with the methodology of analysis.

Sub-Saharan Africa context

The socio-economic and demographic situations in Sub-Saharan Africa changed dramatically over the past decades. The mortality rate has declined dramatically since the 1960s, even though they are still high compared with other regions of the world. The fertility rate has remained high until the 1990s, but gradually started to decline in many countries. As a consequence, the population growth rate increased at the beginning with the mortality decline but later started to slow down with fertility decline as we entered into the 21st century. The infant mortality rate dropped from 144 per 1,000 live births in 1970 to 103 by 2004, whereas the total fertility rate declined from 6.8 births per woman in 1970-75 to 5.5 by 2000-05 (UNDP, 2007). The population growth has been expected to slow down, but the growth itself will continue at least until 2050 because of the population momentum, where the population aged less than 25 years old consisted of 63.5 per cent of the total population in 2005, according to the medium variant estimate of the *World Population Prospects*. The youth aged 15-24 consisted of 20.3 per cent of the total population in the same year (United Nations, 2009).

Economic growth, measured by the increase in per capita income, has recorded rather gloomy progress starting from the 1970s when the world commodity prices plunged into dramatically low levels and hit the African economy severely, and the subsequent decades for Africa were also characterized by the insufficient diversification and growth in economic activities. The GDP per capita was 1,946 US dollars in real terms in 2004 and this is a significant deterioration in real terms compared with the 1970s. The annual growth rate of GDP per capita during the period 1990-2004 showed only 0.3 per cent and the entire period 1975-2004 registered even negative growth of -0.6 per cent in real terms – as a result, the 1975 value of the GDP per capita has been estimated at 2,262 US dollars (UNDP, 2007). This slow economic growth is largely attributed to the world market stagnation starting from the 1970s and then later Africa's growth has been severely challenged by the far more competitive developed country economy as wells as that of other emerging regions of the world, such as Latin America and South Eastern Asia.

The educational attainment, nevertheless, has dramatically improved in the majority of African countries over the decades. The overall net primary enrolment rate has increased to 72 per cent by 2005 (UNDP, 2007). Women's education, compared with that of male counterparts, has registered marked progress, even though this still needs further improvement. By 2005, the net primary enrollment rate for girls increased to 67

per cent while that of boys was 73 per cent (UNESCO, 2008). The female literacy rate as per cent of male rate was 76 in Sub-Saharan Africa in 2004 (UNDP, 2007).

The decades since the 1974 Bucharest Conference have demonstrated important progress in the use of modern contraceptive methods in African countries, even though the pace of increase in Sub-Saharan Africa has been much slower than those of other developing regions, such as Latin America and South Eastern and South Asia, and there are large variations among countries. Overall in Sub-Saharan Africa, the contraceptive prevalence rate increased to 24.7 per cent by early 2000 according to the *World Contraceptive Use 2005* (United Nations, 2005). The 1970s and Bucharest Conference first discussed openly about the necessity to curb rapid population growth for the sake of sustaining economic growth with the use of family planning methods, even though the majority of developing countries including African governments opposed the idea of population control. The 1980s and the Mexico City Conference in 1984 saw the global shift of many developing countries' mindset. They realized economic difficulties possibly and partially emanating from rapid population growth and, as a consequence, most of the developing countries started supporting the family planning programmes favorably as well as the development of population policies. Then, the 1990s and the Cairo Conference in 1994 marked a historical turning point in the field of population and development assistance. The new paradigms emerged with the concepts of "reproductive health and rights" and "gender approach" which replaced traditional "family planning" and "women's rights approach", respectively. The international community now talks about the respect for couple and women's rights regarding reproductive health instead of the reduction of fertility and emphasize more on the further reduction of maternal and infant mortality in addition to the prevention of HIV/AIDS which became an important priority especially for Africa since the 1990s.

Data and methods

The DHS data were used for the analysis. Overall, the individual data of 32 surveys with 12 Anglophone countries and 36 surveys with 17 Francophone countries were incorporated into our database for analysis. The type of survey questionnaire has evolved over the years by allowing some modifications and adding some modules to complement the standardized questionnaire on measuring socio-economic and demographic variables. By now, the DHS has taken place several rounds, namely DHS-I (1986-1989), DHS-II (1990-1993), DHS-III (1993-1999) and DHS measure (1998-2005). For the sake of the analysis of this study, countries were grouped between Anglophone and Francophone countries according to the use of official language. As for the timeframe in this study, the data were grouped into four periods (1986-1990, 1991-1995, 1996-2000 and 2001-2005) in order for us to be able to compare the difference of the grouping effects over the years[7]. As a consequence, the data of two different DHS rounds have been included into a given time period. For instance, the period 1991-1995 contained both DHS-II and DHS-

[7] Some countries were not grouped into the corresponding year group because the analysis tried to group countries at the beginning by DHS rounds. Also, additional country data became available recently for 2005 surveys. Thus, the revision of this study is being planned to adjust these insufficiencies.

III data. However, this mixture of DHS rounds has not affected our analysis because most of the variables we used in this study are rather straightforward standardized socio-economic and demographic variables which were repeatedly collected in each period in study.

Multiple regression models (ordinary least squares) were run for each period first for each language group. The total number of children ever born was used as a measure of the women's fertility level. This variable was regressed against a number of socio-economic and demographic variables. These independent variables are age, socio-economic status index, urbanization, women's education, partners' education, women's literacy, partners' literacy, the average age of first marriage, the average age of first birth, knowledge of modern contraceptive methods, and actual use of modern contraceptive methods. The socio-economic status index was derived from the combination of the availability of water facility, modern toilet facility and electricity in the household of women. For the analysis of DHS-I, the availability of electricity was replaced with the use of the availability of refrigerator as the data on electricity was not directly available for some countries. After evaluating the effects of contraception on fertility outcomes for each language group, then the second analysis combined the data of the two language groups and a language dummy variable was introduced in order to evaluate if there is a difference on the effects of contraception on fertility outcomes between the two language groups. The variable was coded as zero if a woman belonged to an Anglophone country (reference group) and it was coded as one if a woman belonged to a Francophone country. This procedure was repeated for each time period in study. As the DHS data were not designed for longitudinal nature of collecting the information from same individual over periods, we could not use panel or pseudo-panel regression models, even though this would have allowed us to examine the trend effects (an existence of either converging or diverging trend) between the two language groups over the years. In this regard, what we could do with the available data is to analyze the effects of independent variables and evaluate the magnitudes and changes of the effects for the language dummy between the four time periods.

Descriptive statistics

Table 4 shows the summary of selected indicators that are derived from the DHS data used in this study between Anglophone and Francophone countries. It shows a clear contrast on some important elements inherent in each language-culture zone. The level of urbanization in Anglophone countries (between 30 and 34 per cents) was lower than that of Francophone counterparts (between 33 and 40 per cents) throughout the four study periods. Urbanization is often considered to be associated with its negative effect on fertility as the urban dwelling is likely to provide a better chance for access to modern socio-economic infrastructure. In this regard, the Francophone group may be inclined to have stronger impacts on fertility. However, the values in socio-economic index (not shown) which were composed of the availability of water, toilet and electricity facilities in women's households are much higher in Anglophone countries for each of the four study periods. It seems that the higher level of urbanization in Francophone countries has

not been translated into the better access to basic social infrastructure. Thus, we expect the effects of social infrastructure on fertility to be stronger in Anglophone countries.

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Likewise, women's education and literacy levels show a clear contrast between Anglophone and Francophone countries over the four study periods. Women in Anglophone countries are not only more educated at the level of primary schooling but also at the secondary and higher levels of schooling. While the women with primary school education in Anglophone countries varied from 46 to 53 per cent for the period 1986-2005, the values for Francophone counterparts ranged from merely 19 to 30 per cent. The same is true for literacy. The literacy level for women in Anglophone countries varied from 45 to 59 per cent for the period 1986-2005, whereas the level for women in Francophone countries varied from 18 to 38 per cent – much lower. As it is conventionally considered that women's education and literacy would reduce fertility, we expect this effect to be stronger for Anglophone group.

The average age at first marriage as well as the average age at first birth does not seem to show any particular difference between Anglophone and Francophone groups. The average age at first marriage in Anglophone countries varied from 17.5 to 18.2 years old during the period 1986-2005, whereas the values for Francophone countries varied from 17.0 to 17.7 years old. Likewise, the average age at first birth in Anglophone countries varied from 18.5 to 18.9 years old, whereas the values for Francophone countries varied from 18.6 to 18.9 years old. We know that in general both the average age at first marriage and average age at first birth are on the rise in Sub-Saharan Africa increasingly with modern socio-economic development, but the difference between the two language zones may be marginal.

The variables which are related to family planning programmes are the women's knowledge on modern contraceptive methods and the current use of modern contraceptive methods. These two variables also demonstrated the existence of a large gap in attitudes towards family planning between Anglophone and Francophone groups. We presume that the proportion of women who know the modern contraceptive methods increased over the years for both groups but its value is much higher with the Anglophone group. By the period 2001-2005, 94.0 per cent of women knew modern contraceptive methods in Anglophone countries, whereas this proportion was 85.2 per cent for Francophone counterparts. The current use of modern contraceptive methods also increased over the years in Sub-Saharan Africa in general and this has been confirmed in both Anglophone and Francophone groups from our data. However, again its proportion is much higher with the Anglophone group. The period 2001-2005 showed that 20.7 per cent of women in Anglophone group were using modern contraceptive methods, whereas this proportion was only 9.4 per cent with the Francophone group. In sum, as those family planning variables are generally considered to depress fertility, we expect the effects of the family planning variables much stronger with the Anglophone group.

Results of regression models

1986-1990

Table 5 shows the results of the three regression models in the 1986-1990 period for: (1) Anglophone group (first column) [five countries: Ghana 1988, Kenya 1989, Liberia 1986, Uganda 1988 and Zimbabwe 1988]; (2) Francophone group (second column) [four countries: Burundi 1987, Mali 1987, Senegal 1986 and Togo 1988]; and (3) a model with cumulative data of all nine countries with the introduction of language dummy variable (third column). As we compare the results between the Anglophone and Francophone groups, we notice some differences in the effects of independent variables. For the effects of socio-economic index and urbanization, they were not significant for the Francophone group, whereas these effects were strong and significant for the Anglophone group. In previous section, we showed descriptive statistics with the availability of water, toilet and electricity facilities in women's household, thus we presume that this is a good proxy to measure the level of the development of social infrastructure. Anglophone countries showed more advanced level of access to social infrastructure than Francophone counterparts. In fact, the results of the regression models confirmed this difference between the language groups. The effects of urbanization and socio-economic index were strong and significant for Anglophone group, while they were not significant for Francophone group.

"Table 5 here"

The effects of education for women and their partners as well as those of literacy for women and their partners show interesting contrasts between the two language groups. While the effects of education to depress fertility were significant for educational variables in the Francophone group, those effects were statistically not strong enough in the Anglophone counterpart. On the other hand, these effects were reversed between the language groups with literacy variables. The Anglophone group had negative effects on fertility with higher levels of literacy, whereas these effects were not significant in the Francophone group. Our interpretation for these rather unexpected results is the following. If we look at the educational level achieved by the Anglophone group, especially those of Kenya and Zimbabwe, this may shed a light on the understanding of the difference in the effects by the educational variables. In Kenya, 53.5 per cent of women attended primary school and 22.6 percent of women attended secondary school or higher level of educational institutions by 1989. In Zimbabwe, 55.9 per cent attended primary school, while 31.0 percent attended secondary school or higher by 1988. With cumulative data of five Anglophone countries, 46.8 per cent of women achieved the primary school level education and 18.2 per cent of them achieved the secondary or higher level of schooling by the late 1980s. These aggregated figures were less impressive in four Francophone countries as the cumulative data showed that only 19.8 per cent of women attended primary school and 7.5 per cent of them attended secondary and higher level of educational institutions.

The effects of family planning variables were statistically significant. The knowledge on modern contraceptive methods would reduce fertility levels in both Anglophone and Francophone groups, but this effect was weaker in Francophone group as the significance level was five per cent. Current use of modern contraceptive methods would also reduce fertility levels in both groups, but again its effect was weaker in Francophone group. These are in line with our expected results which would confirm the results of weaker efforts on family planning programmes in Francophone countries.

The effect of group difference in fertility outcomes which was measured by the dummy variable (model 3) was significant at the level of five per cent. The author's previous study suspected the existence of the language group difference between Francophone and Anglophone countries, and consequently pointed out earlier fertility decline in Anglophone countries compared with that of Francophone counterpart (Ohashi, 2001). The results of the model 3 seem to endorse the assertion in particular that there was a significant group difference in fertility outcomes in the late 1980s when the Sub-Saharan Africa as a whole has been considered to have entered fertility transition. The inference deriving from this finding is that Anglophone group led the fertility transition as a front runner, whereas the majority of Francophone countries had not started the transition yet or merely had been at its very early stage.

1991-1995

Table 6 shows the results of the subsequent period of 1991-1995 during which mainly DHS-II data were used. Anglophone group contained five countries [Malawi 1992, Namibia 1992, Nigeria 1990, Tanzania 1992 and Zambia 1992], whereas Francophone group included six countries [Burkina Faso 1992/93, Cameroon 1991, Madagascar 1992, Niger 1992, Rwanda 1992 and Senegal 1992/93]. The effects of socio-economic status index and urbanization were strong and significant for both Anglophone and Francophone models, suggesting the acceleration and onset of fertility transitions for respective language groups as we assume an earlier fertility transition for Anglophone group.

"Table 6 here"

As with the results of the period of 1986-1990, the effects of education on fertility were negative and significant in Francophone countries but were not significant in Anglophone countries, whereas the effects of literacy were negative and significant in Anglophone countries but were not significant in Francophone countries. These results are not intuitively convincing, but we suppose that the effects of education in Anglophone group are smaller across the generations of women compared with Francophone counterpart, as the larger proportion of women in Anglophone countries is educated. Thus, the educational difference across different age groups may be less important as we discussed for the period of 1986-1990.

The effects of family planning variables were strong. The knowledge on modern contraceptive methods would reduce fertility levels significantly in both Anglophone and

Francophone groups. Current use of modern contraceptive methods would also strongly reduce fertility levels in both groups. Compared with the previous period of 1986-1990, the effects were stronger for both Anglophone and Francophone groups. The early 1990s may be characterized by the acceleration of family planning programmes as they have become socially more acceptable.

The effect of the language dummy variable (model 3) was much stronger than the previous period, implying that the group distinction became more evident in the period in study. We assume that the pace of the fertility decline of Anglophone group was accelerated during the period, while the fertility decline of Francophone group had been still slow at their early stage.

1996-2000

Table 7 shows the results of the regression estimates in the subsequent period of 1996-2000. The third round of DHS (DHS-III) were mainly undertaken during the period, even though some countries had already initiated the new generation of survey, DHS-measure+, which allowed policy-makers to add complementary thematic modules to the base questionnaire according to the country's context and government's wish. The data were abundant during the period with five Anglophone countries [Kenya 1998, South Africa 1998[8], Tanzania 1996, Uganda 1995 and Zambia 1996] and twelve Francophone countries [Benin 1996, Burkina Faso 1998/99, Cameroon 1998, Central African Republic 1994/95, Chad 1996/97, Cote d'Ivoire 1998/99, Madagascar 1997, Mali 1995/96, Niger 1996, Senegal 1997 and Togo 1996]. The socio-economic status index as well as urbanization variables were strongly significant and would tend to reduce women's fertility in both language groups. In fact, the mid to late 1990s are likely to be characterized by the acceleration of the fertility decline in Anglophone countries and the onset of the fertility decline in Francophone countries. Thus, the socio-economic progress would account for an important proportion of those fertility declines in Sub-Saharan Africa.

"Table 7 here"

The effect of women's education was not significant for Anglophone group, even though that of literacy was significant and had negative impacts on fertility. For Francophone group, the effects of those two variables were both significant and negative. The same explanation as in the period 1991-1995 may be advanced for the effects of education related variables between the language groups.

The effects of family planning variables were significant for both groups. The knowledge on modern contraceptive methods as well as the current use of modern contraceptive methods would reduce women's fertility strongly. The 1990s have been also characterized by the real emergence of the public awareness on the spread of

[8] The data on non black African population were excluded from the analysis, considering the country's racial segregation history.

HIV/AIDS epidemic in Sub-Saharan Africa, in particular for Eastern and Southern African countries where the prevalence has been much higher compared with Western and Central Africa. Research findings show that those increased awareness among the public as well as policy-makers had important impact on adjusting national health policy and had influence on promoting preventive measures for HIV infection. Many countries actively sought ABC (abstain, be faithful, condom) approach and this has had important effects on people's behavior change and the promotion for the use of barrier methods (mainly condom) for the sake of the prevention of HIV transmission especially among young couples. In this regard, we would say that certain proportion of the increase in the knowledge and use of modern contraceptive methods is attributed to the increased public awareness for HIV prevention, even though this hypothesis has to be substantiated with empirical studies.

The model 3 with the effect of language dummy was significant again, demonstrating the existence of a gap in fertility outcomes between the two language-culture groups. The lower fertility level in Anglophone group would probably reflect further acceleration of its fertility transition, even though Francophone counterpart must have also increased efforts in family planning and thus entered fertility transition in mid-1990s.

2001-2005

Table 8 shows the results of regression estimates for the last period in study 2001-2005. This period was mainly covered by DHS-measure+ type of surveys. The data included nine Anglophone countries [Ghana 2003, Kenya 2003, Lesotho 2004, Malawi 2004, Namibia 2000, Nigeria 2003, Tanzania 2004/05, Uganda 2000/01 and Zambia 2001/02] and eight Francophone countries [Benin 2001, Burkina Faso 2003, Cameroon 2004, Chad 2004, Gabon 2000, Madagascar 2003/04, Mali 2001 and Rwanda 2000]. The negative effects of socio-economic status index and urbanization on fertility were confirmed for both Anglophone and Francophone models. The ongoing fertility declines in both language zones have been influenced importantly by socio-economic development.

"Table 8 here"

Women's education and literacy show their strong negative effects on fertility in both Anglophone and Francophone models. The accelerated fertility declines in both language groups would have caused the expected variations for the variables and this has resulted in producing the significance of the effects of the educational variables.

Among the family planning variables, the effect of the knowledge on modern contraceptive methods in Anglophone countries did not show expected significance on fertility outcome. Otherwise, the rest of the variables all show significant negative impacts on fertility for both Anglophone and Francophone groups. As the contraceptive knowledge has increased dramatically in the past decades, most of the women in reproductive age already know modern contraceptive methods. The lack of data variation (variance) may have caused the effect of the independent variables to be non significant.

The model 3 with language dummy variable again confirmed the existence of difference in its effect on fertility outcomes between Francophone and Anglophone groups. We presume that fertility transition is well underway in both language zones by now but its pace is relatively slower for Francophone group compared with that of Anglophone group, as demonstrated by the limited increase in the use of modern contraceptive methods.

Discussion

Overall, the results for the effects of language dummy variable on fertility outcomes showed the existence of statistically significant difference between Francophone and Anglophone groups throughout the four study periods, even though the effect of dummy variable in the period 1986-1990 was relatively weaker compared with later periods in study. To investigate the validity of the results, we may need to first take a look at the selection and appropriateness of the representation of the countries in which data were included in the analysis. For instance, in the period 1986-1990 the Anglophone group was composed of two Western African countries (Ghana and Liberia), two Eastern African countries (Kenya and Uganda) and one Southern African country (Zimbabwe). This composition with sub-regional variation would probably reasonably represent the sub-regional level geographical diversity in the language group, thus we do not find any partiality and conclude that this group is well represented. As for Francophone group, they were composed of three Western African countries (Mali, Senegal and Togo) and one Eastern African country (Burundi). As the Francophone countries have been mainly located in Western and Central African sub-regions, this group also represents the group's geographical diversity fairly. Given the above, the group difference effect we found in the model 3 would probably reflect the existence of a major tendency between the two language groups, that is, earlier fertility decline in Anglophone countries. For the period 1986-1990 the fertility decline in Anglophone group was largely led by Zimbabwe and Ghana. Kenya's fertility decline was also substantive compared with their historically highest level of fertility recorded in the 1960s-1970s periods with the total fertility rate of more than eight children per woman. The absolute level of fertility in Burundi may have been lowered in Francophone group by the period 1986-1990, but the Francophone group's relatively higher level of fertility was particularly obvious with the Mali data. For the later periods in study, the availability of DHS data increased dramatically. The appropriateness of representation for both Francophone and Anglophone groups for which the data were available does not seem to have affected the regression estimates for the dummy variables models.

The fertility decline in Anglophone group may have started in the 1970s, largely led by urban areas. The onset of the fertility transition in Anglophone group may be marked in mid to late 1980s and the fertility decline has been accelerated since the 1990s onwards. This trend and the relatively faster pace of the fertility decline seem to continue in the near future until TFR will approach its replacement level of 2.1 and this would slow down the pace of the decline eventually. On the other hand, the onset of the fertility transition in Francophone group must have been delayed at least for a decade, thus this is

likely to be marked in mid to late 1990s, even though the fertility decline may have started in the 1980s. Besides, the pace of the fertility decline seems to be relatively slower for the time being.

Another important aspect to be integrated into the analysis of African fertility decline is the impact of HIV/AIDS epidemic. Research findings show that the increased HIV prevalence and AIDS related deaths have negative impacts on fertility through multiple factors. Non infected population is likely to change sexual behavior by reducing multiple sexual partnership and frequency for sexual intercourse and by delaying first marriages and reducing premarital sexual relations to avoid infection (also due to more frequent widowhood with the loss of partners) (Gregson et al., 2004; Ntozi, 2002), and infected population is: (1) likely to experience lower conception/pregnancy rates (also due to more frequent divorce) and higher pregnancy loss rates (with miscarriage and stillbirth) irrespective of the awareness of their serostatus (Gray et al., 1998); and (2) likely to reduce sexual intercourse to avoid further infection to and from partners and avoid potential mother to child transmission in the event they will have another child (Grieser et al., 2001; Terceira et al., 2003). Recent DHS has started incorporating the HIV status of the respondents in order to allow policy-makers and researchers to be able to understand and analyze the situations with more appropriate and transparent manners but at present the number of the countries that have already undergone this type of questionnaire has been limited, thus we need to wait at least until late 2000s for the comparison between the two language groups if the impact of HIV/AIDS on fertility based on DHS data would provide another insight on our analysis.

Conclusion

As this study attempted to prove it empirically, if we consider that there are in fact different patterns in fertility transition between Anglophone and Francophone countries in Sub-Saharan Africa as culturally distinct groups, we demonstrated the demographic evidence that the fertility transition in Anglophone group started in mid to late 1980s while that of Francophone group started in mid to late 1990s. The difference in timing for the onset of fertility transitions would be about ten years and this difference may not be much in the end as we are certain that the fertility levels of both language zones will continue to fall until 2.1, the level of replacement, or beyond eventually. However, in addition if there is a difference in the pace of decline – much slower in Francophone countries due to their relative reluctance to fertility change, largely attributed to the French colonial and neo-colonial legacy, the timeframe for the total period it would take for Francophone countries to finalize its fertility transition would be much longer compared with Anglophone counterparts.

We know from the experiences that the fertility transition in France took more than a century from at least early 1800s to 1930s when the total fertility rate finally dropped to 2.1. On the other hand, the fertility transition in United Kingdom, in particular that of England was completed within the relatively short time span of 50 to 60 years from 1870s to 1930s (Friedlander and Okun, 1996). The results of European fertility study by Princeton group demonstrated a clear message that culture and language played

a major role in fertility transition and in particular the groups that shared the same language and culture experienced the fertility transitions around the same time, largely independently of the socio-economic difference (Anderson, 1986; Coale, 1973; Coale and Watkins, 1986; Lesthaeghe, 1977; Knodel and van de Wall, 1979; Watkins, 1986). This phenomenon was also pointed out for the English-speaking European decent for the people of Australia, Nez Zealand, the United States and English-speaking Canada (Caldwell and Ruzicka, 1978). These analyses in Europe are just indications that the fertility transitions could be considered by language grouping and fertility decline patterns in Francophone and Anglophone countries in Sub-Saharan Africa could resemble those of France and UK. Other examples on countries and regions in sharing the same language and culture to experience fertility declines simultaneously have been found in many developing countries, such as Chinese speaking countries and regions (Wu and Jia, 1991), Spanish speaking Lain American countries, Arabic speaking countries in Middle East and North Africa. Of course, the historical context is different, the grouping of all Francophone countries in Sub-Saharan Africa and assuming the existence of group tendency in modern socio-economic environment could be still too simplistic and may need further study. However, this is an interesting hypothesis to consider and it is indeed interesting to see the ongoing fertility transition in Sub-Saharan Africa with a different perspective.

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Table 1. Total fertility rate (births per woman)

	1970-75	2000-05
Developing countries	5.4	2.9
Least developed countries	6.6	4.9
Arab States	6.7	3.6
East Asia and the Pacific	5.0	1.9
Latin America and the Caribbean	5.0	2.5
South Asia	5.5	3.2
Sub-Saharan Africa	6.8	5.5

Source: UNDP (2007) Human Development Report 2007/2008

Table 2. Primary gross enrollment ratio, 1970-2005

Francophone countries				Anglophone countries			
		MF	F			MF	F
Benin	2005	96	85	Botswana	2005	107	106
	2000	77	63		2000	105	105
	1995	65	47		1995	103	104
	1990	48	33		1990	104	108
	1985	64	43		1985	98	103
	1980	58	39		1980	88	96
	1975	47	29		1975	70	77
	1970	34	21		1970	59	62
Burkina Faso	2005	56	50	Gambia	2005	74	77
	2000	44	36		2000	77	71
	1995	39	31		1995	67	58
	1990	32	25		1990	57	49
	1985	24	18		1985	62	48
	1980	17	12		1980	40	27
	1975	14	10		1975	29	19
	1970	12	9		1970	24	15
Burundi	2005	82	76	Ghana	2005	87	85
	2000	60	53		2000	80	77
	1995	51	45		1995	73	69
	1990	70	62		1990	71	65
	1985	48	39		1985	71	63
	1980	24	19		1980	74	66
	1975	21	16		1975	64	57
	1970	32	21		1970	65	59
Cameroon	2005	108	98	Kenya	2005	108	106
	2000	86	79		2000	97	96
	1995	81	77		1995	90	90
	1990	96	89		1990	101	99
	1985	96	88		1985	109	106
	1980	91	83		1980	115	109
	1975	89	79		1975	103	94
	1970	88	75		1970	62	51
CAR	2005	61	49	Lesotho	2005	114	114
	2000	64	51		2000	114	116
	1995	-	-		1995	108	114
	1990	68	52		1990	109	119
	1985	75	54		1985	109	121

	1980	70	51		1980	97	114
	1975	70	47		1975	100	119
	1970	63	41		1970	85	102
Chad	2005	76	61	Liberia	2005	91	87
	2000	66	50		2000	100	84
	1995	47	30		1995	-	-
	1990	49	30		1990	-	-
	1985	35	19		1985	35	-
	1980	-	-		1980	47	33
	1975	32	17		1975	39	26
	1970	34	17		1970	-	-
Comoros	2005	85	80	Malawi	2005	120	122
	2000	84	77		2000	137	134
	1995	76	-		1995	135	127
	1990	72	59		1990	65	58
	1985	80	76		1985	58	49
	1980	83	-		1980	60	48
	1975	53	38		1975	55	42
	1970	32	20		1970	37	27
Congo	2005	107	102	Namibia	2005	106	106
	2000	83	80		2000	104	104
	1995	116	106		1995	120	120
	1990	123	118		1990	121	126
	1985	131	127		1985	127	-
	1980	129	124		1980	-	-
	1975	124	114		1975	-	-
	1970	114	99		1970	-	-
Cote d'Ivoire	2005	71	62	Nigeria	2005	96	87
	2000	69	59		2000	91	80
	1995	63	53		1995	84	75
	1990	66	55		1990	85	73
	1985	72	59		1985	111	98
	1980	75	59		1980	97	84
	1975	64	48		1975	50	40
	1970	59	43		1970	40	30
DRC	2005	61	53	Sierra Leone	2005	147	139
	2000	61	54		2000	65	-
	1995	71	58		1995	-	-
	1990	54	45		1990	58	47
	1985	84	66		1985	68	56

	1980	89	73		1980	55	44
	1975	89	70		1975	37	29
	1970	91	67		1970	35	28
Gabon	2005	152	152	South Africa	2005	106	103
	2000	146	146		2000	108	106
	1995	153	152		1995	120	119
	1990	155	153		1990	107	106
	1985	160	158		1985	102	101
	1980	164	161		1980	81	-
	1975	168	162		1975	99	-
	1970	156	148		1970	97	97
Guinea	2005	86	77	Swaziland	2005	106	102
	2000	61	50		2000	100	97
	1995	48	33		1995	99	98
	1990	34	22		1990	94	94
	1985	37	24		1985	93	93
	1980	39	26		1980	87	87
	1975	34	22		1975	84	82
	1970	33	21		1970	76	73
Madagascar	2005	139	136	Uganda	2005	118	118
	2000	99	97		2000	125	122
	1995	79	81		1995	67	61
	1990	92	90		1990	67	60
	1985	113	109		1985	73	-
	1980	129	124		1980	51	44
	1975	89	84		1975	45	36
	1970	82	76		1970	39	31
Mali	2005	77	67	Tanzania	2005	107	105
	2000	61	51		2000	69	68
	1995	42	34		1995	68	67
	1990	30	22		1990	69	69
	1985	29	21		1985	76	76
	1980	31	23		1980	96	90
	1975	29	21		1975	53	45
	1970	27	19		1970	34	27
Niger	2005	50	42	Zambia	2005	115	111
	2000	33	27		2000	80	77
	1995	29	22		1995	86	83
	1990	27	20		1990	94	90
	1985	23	17		1985	100	94

	1980	22	16		1980	91	85
	1975	15	11		1975	92	83
	1970	12	9		1970	89	79
Rwanda	2005	128	130	Zimbabwe	2005	101	101
	2000	96	94		2000	100	98
	1995	-	-		1995	104	103
	1990	70	67		1990	101	100
	1985	68	64		1985	126	123
	1980	65	61		1980	86	-
	1975	54	48		1975	71	65
	1970	66	58		1970	72	65
Senegal	2005	80	78				
	2000	67	62				
	1995	55	48				
	1990	55	46				
	1985	52	42				
	1980	43	34				
	1975	40	34				
	1970	38	30				
Togo	2005	99	91				
	2000	104	91				
	1995	101	81				
	1990	89	70				
	1985	82	63				
	1980	107	82				
	1975	83	56				
	1970	65	40				
Average	2005	90	83	Average	2005	106	104
	2000	76	68		2000	97	96
	1995	70	60		1995	95	92
	1990	68	59		1990	87	84
	1985	71	60		1985	89	87
	1980	73	62		1980	78	71
	1975	62	50		1975	66	58
	1970	58	45		1970	58	53

Source: UNESCO

Table 3. Religions in Francophone countries in 2009 (%)

	Christian			Muslim	Other
	Catholic	Protestant	Other		
Benin	27.1	10.4	5.3	24.4	32.8
Burkina Faso	10.0	0.0	0.0	50.0	40.0
Burundi	62.0	5.0	0.0	10.0	23.0
Cameroun	40.0	0.0	0.0	20.0	40.0
Central African Republic	25.0	25.0	0.0	15.0	35.0
Chad	20.1	14.2	0.0	53.1	12.6
Comoros	2.0	0.0	0.0	98.0	0.0
Republic of the Congo	50.0	0.0	0.0	2.0	48.0
Democratic Republic of the Congo	50.0	20.0	10.0	10.0	10.0
Cote d'Ivoire	32.8	0.0	0.0	38.6	28.6
Gabon	75.0	0.0	0.0	1.0	1.0
Guinea	8.0	0.0	0.0	85.0	7.0
Madagascar	41.0	0.0	0.0	7.0	52.0
Mali	1.0	0.0	0.0	90.0	9.0
Mauritania	0.0	0.0	0.0	100.0	0.0
Niger	10.0	0.0	0.0	80.0	10.0
Rwanda	56.5	26.0	11.1	4.6	1.8
Senegal	5.0	0.0	0.0	94.0	1.0
Togo	29.0	0.0	0.0	20.0	51.0

Source: CIA World Factbook (https://www.cia.gov/library/publications/the-world-factbook/countrylisting.html#g)

Table 4. Selected indicators between Francophone and Anglophone countries in Sub-Saharan Africa, DHS 1986-2005

		1986-1990[1]	1991-1995[2]	1996-2000[3]	2001-2005[4]
Average number of children ever born	Anglophone	3.3	3.1	2.8	2.8
	Francophone	3.3	3.2	3.3	3.1
Urbanization (%)	Anglophone	30.1	33.8	33.1	30.9
	Francophone	33.4	38.2	40.0	40.0
Women's education (primary, secondary+) (%)	Anglophone	46.8 18.2	48.7 18.4	53.4 29.3	49.7 29.7
	Francophone	19.8 7.5	29.5 16.8	24.4 14.5	29.8 22.1
Women's literacy (%)	Anglophone	48.3	45.4	57.7	58.7
	Francophone	18.0	32.9	21.6	37.8
Average age at first marriage (Years)	Anglophone	17.5	17.5	18.2	18.1
	Francophone	17.5	17.0	17.0	17.7
Average age at first birth (Years)	Anglophone	18.5	18.6	18.7	18.9
	Francophone	18.9	18.7	18.6	18.9
Knowledge on modern contraceptive methods (%)	Anglophone	82.6	73.8	92.9	94.0
	Francophone	62.4	73.6	76.1	85.2
Current use of modern contraceptive methods (%)	Anglophone	11.4	8.1	21.6	20.7
	Francophone	2.6	6.0	6.2	9.4

Note:

[1] 5 Anglophone countries and 4 Francophone countries

[2] 5 Anglophone countries and 6 Francophone countries

[3] 4 Anglophone countries and 4 Francophone countries

[4] 9 Anglophone countries and 8 Francophone countries

Table 5. The regression estimates of the family planning effects on fertility in Sub-Saharan Africa, DHS 1986-1990

	Model 1	Model 2	Model 3
	Anglophone group	Francophone group	Cumulative data with all countries
Dummy variable (official language)			-0.1661
			(-7.73)**
Socio-economic variables			
Age group	1.0984	1.2051	1.1153
	(140.38)**	(134.20)**	(182.37)**
Socio-economic status index[1]	-0.1684	-0.1436	-0.1597
	(-9.86)**	(-5.29)**	(-11.30)**
Urbanization	-0.3741	-0.2447	-0.2877
	(-11.77)**	(-6.25)**	(-11.79)**
Women's education	-0.1275	-0.2175	-0.1198
	(-4.84)**	(-5.32)**	(-5.43)**
Women's literacy	-0.2761	-0.1187	-0.2385
	(-7.84)**	(-1.87)	(-7.79)**
Marital status	0.9583	0.7301	1.0272
	(27.82)**	(21.48)**	(36.98)**
Family planning variables			
Knowledge on modern contraceptive methods	0.4894	0.1882	0.3131
	(14.58)**	(5.55)**	(13.15)**
Current use of modern contraceptive methods	0.4594	0.4652	0.4438
	(11.57)**	(4.65)**	(12.13)**
Intercept	-1.0184	-1.0422	-1.0331
	(-24.40)**	(-24.49)**	(-31.13)**
Number of observations	25798	14944	40742
F Test	0.0000	0.0000	0.0000
Adjusted R^2	0.6129	0.6083	0.6114

Note : The numbers in parenthesis are the t statistics

** significant at 1% level; * significant at 5% level

[1] [water facility + toilet facility + refrigerator in the household]

Table 6. The regression estimates of the family planning effects on fertility in Sub-Saharan Africa, DHS 1991-1995

	Model 1	Model 2	Model 3
	Anglophone group	Francophone group	Cumulative data with all countries
Dummy variable (official language)			0.0115
			(0.78)
Socio-economic variables			
Age group	1.0728	1.1390	1.1049
	(168.49)**	(173.14)**	(241.52)**
Socio-economic status index[1]	-0.1055	-0.1577	-0.1278
	(-7.86)**	(-10.78)**	(-12.98)**
Urbanization	-0.1059	-0.1656	-0.1464
	(-3.77)**	(-6.30)**	(-7.63)**
Women's education	-0.2571	-0.2495	-0.2548
	(-11.61)**	(-10.27)**	(-15.79)**
Women's literacy	-0.1965	-0.2371	-0.2048
	(-6.88)**	(-6.38)**	(-9.00)**
Marital status	0.9577	1.0762	1.0256
	(34.69)**	(36.52)**	(50.85)**
Family planning variables			
Knowledge on modern contraceptive methods	0.4009	0.0955	0.2399
	(16.36)**	(3.86)**	(13.78)**
Current use of modern contraceptive methods	0.3039	0.4852	0.4006
	(7.86)**	(10.84)**	(13.66)**
Intercept	-0.9720	-0.9923	-0.9856
	(-30.13)**	(-31.43)**	(-41.19)**
Number of observations	35348	35845	71193
F Test	0.0000	0.0000	0.0000
Adjusted R^2	0.6155	0.6219	0.6176

Note : The numbers in parenthesis are the t statistics

** significant at 1% level; * significant at 5% level

[1] [water facility + toilet facility + electricity in the household]

Table 7. The regression estimates of the family planning effects on fertility in Sub-Saharan Africa, DHS 1996-2000

	Model 1	Model 2	Model 3
	Anglophone group	Francophone group	Cumulative data with all countries
Dummy variable (official language)			0.0538
			(4.10)**
Socio-economic variables			
Age group	0.9584	1.1048	1.0579
	(168.90)**	(256.59)**	(307.79)**
Socio-economic status index[1]	-0.2389	-0.1797	-0.2121
	(-21.19)**	(-18.01)**	(-28.36)**
Urbanization	-0.2817	-0.2812	-0.2806
	(-12.13)**	(-16.21)**	(-20.17)**
Women's education	-0.3291	-0.3177	-0.3098
	(-17.41)**	(-18.88)**	(-25.21)**
Women's literacy	-0.2221	-0.1367	-0.1620
	(-9.38)**	(-4.74)**	(-8.65)**
Marital status	1.0426	0.9883	1.0048
	(44.43)**	(47.85)*	(64.33)**
Family planning variables			
Knowledge on modern contraceptive methods	0.4059	0.1530	0.2011
	(11.23)**	(8.81)**	(13.09)**
Current use of modern contraceptive methods	0.2357	0.4090	0.2750
	(10.18)**	(13.68)**	(14.76)**
Intercept	-0.6449	-0.9052	-0.8300
	(-16.52)**	(-40.85)**	(-38.37)**
Number of observations	40,071	78,366	118,437
F Test	0.0000	0.0000	0.0000
Adjusted R^2	0.6115	0.6076	0.6087

Note : The numbers in parenthesis are the t statistics

** significant at 1% level; * significant at 5% level

[1] [water facility + toilet facility + electricity in the household]

Table 8. The regression estimates of the family planning effects on fertility in Sub-Saharan Africa, DHS 2001-2005

	Model 1	Model 2	Model 3
	Anglophone group	Francophone group	Cumulative data with all countries
Dummy variable (official language)			0.0405
			(4.02)**
Socio-economic variables			
Age group	0.9491	1.0508	1.0017
	(236.24)**	(248.23)**	(343.47)**
Socio-economic status index[1]	-0.1527	-0.1284	-0.1510
	(-18.64)**	(-14.07)**	(-24.82)**
Urbanization	-0.2920	-0.2443	-0.2630
	(-17.52)**	(-13.81)**	(-21.65)**
Women's education	-0.4564	-0.2938	-0.3454
	(-35.25)**	(-18.32)**	(-36.91)**
Women's literacy	-0.2155	-0.3178	-0.3338
	(-12.48)**	(-12.95)**	(-25.14)**
Marital status	0.9242	0.8831	0.9004
	(52.49)**	(44.47)**	(68.12)**
Family planning variables			
Knowledge on modern contraceptive methods	0.1628	0.1025	0.1325
	(5.82)**	(5.04)**	(8.18)**
Current use of modern contraceptive methods	0.2507	0.2864	0.2536
	(15.28)**	(11.78)**	(18.44)**
Intercept	-0.3443	-0.6605	-0.5298
	(-11.61)**	(-27.92)**	(-27.45)**
Number of observations	72,286	72,839	145,125
F Test	0.0000	0.0000	0.0000
Adjusted R^2	0.6215	0.6214	0.6220

Note : The numbers in parenthesis are the t statistics

** significant at 1% level; * significant at 5% level

[1] [water facility + toilet facility + electricity in the household]