Proximate determinants of fertility in Mongolia

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Variations in fertility in a population occur basically due to variations in one or more of the proximate determinants of fertility. This paper analyses the fertility effects of the major proximate determinants in Mongolia by using the Bongaarts' framework. The analyses include the examination of the impact of each proximate determinant on the national fertility level, as well as its variations by social background characteristics of women, such as place of residence, income and educational level.

Examination of the effects of the major proximate determinants of fertility in Mongolia, using the Bongaarts framework reveals that fertility levels of women with different background characteristics vary significantly due to variations in the proximate determinants.

Overall, the fertility level in Mongolia is largely influenced by a decline in the proportions married among women of reproductive age, the individual effect of which is to reduce the total fecundity by 6.0 live births per woman. The next largest contributor to the decline of total fecundity (TF) is current use of contraception, the individual effect of which is to reduce the TF by 4.35 live births per woman. However, the total abortion rate (TAR) is relatively high in Mongolia. The analysis shows that women who fail to use effective methods of contraception are likely to control their fertility through induced abortion.

Key words: *fertility, marriage, contraceptive use, induced abortion, postpartum insusceptibility,*

Introduction

Variations in fertility in a population occur basically due to variations in one or more of the proximate determinants of fertility (Bongaarts 1978). This paper aims to analyse the fertility effects of the major proximate determinants in Mongolia by using the Bongaarts' framework (Bongaarts 1978; Bongaarts and Potter 1983). The analyses include the examination of the impact of each proximate determinant on the national fertility level, as well as its variations by social background characteristics of women, such as place of residence, income and educational level.

Classifying the entire population into rural and urban areas by the standard definition, assuming that all provincial centers are urban, may not completely show the effects of urbanisation or modernization. Keeping this in view, the fertility variations have been also examined by area of residence, namely Ulaanbaatar city (population of one million), provincial center, *Som* center and remote rural areas, the latter consisting predominantly of nomadic populations.

Moreover, possible changes in the proximate determinants to increase the fertility level of Mongolia are examined by simulating the effects of hypothetically changing the value of each of the proximate determinants.

Method of analysis

Bongaarts (1978, p. 118) proposed that the observed total fertility rate (TFR) of a population could be approximated by multiplying the maximum fecundity of women by a set of indices which measure the effect of the four proximate determinants and expressed his formulation in the following equation:

$$TFR=TF*Cm*Cc*Ci*Ca$$

where, TFR is the observed fertility of the population, TF (total fecundity) is the maximum natural fertility in the absence of the fertility inhibiting factors, Cm is the index of marriage, Cc is the index of contraception, Ci is the index of postpartum insusceptibility and Ca is the index of induced abortion.

Bongaarts has assumed TF to be in the range 13 to 17 births per woman based on observations of different populations. TF reduces to the observed TFR in a population by the influence of each proximate determinant as shown in the equation above (Bongaarts 1978, p. 118).

The indices can only take values between 0 and 1. It takes the value 1 when there is no fertility inhibiting effect of the given proximate determinant and it takes the value 0, if the fertility inhibition is complete (Bongaarts & Potter 1983, p. 80). Each index equals the ratio of the fertility levels in the presence and absence of the inhibition caused by the corresponding proximate determinant (Bongaarts & Potter 1983, p. 80). In other words:
Cm=TFR/TM, where TM is total marital fertility.

Cm is the index of marriage and gives the proportion by which the TFR should be smaller than TM as the result of non-marriage (Bongaarts 1978, p. 109). Cm is estimated as the weighted average of the age-specific proportions married, m(a) where a is age with the weights given by the age-specific marital fertility rates, g(a) (Bongaarts & Potter 1983, p. 81). In other words,

$$Cm=\Sigma(m(a)*g(a))/\Sigma g(a)$$

Cc, the index of contraception, is calculated by the formula (Bongaarts & Potter 1983, p. 82):

$$Cc=1-1.08*u*e,$$

where u is proportion of married women of reproductive age currently using contraception and e is the average use-effectiveness of contraception. The equation shows that with increasing prevalence of contraceptive use and its effectiveness, the Cc declines below 1.

The index of induced abortion, Ca, is defined as the ratio of the observed TFR to the estimated TFR without induced abortion and calculated as (Bongaarts & Potter 1983, p. 86):

$$Ca=TFR/(TFR+b*TAR)$$

where TAR is the total abortion rate per women and b is the average number of births averted per induced abortion, which is approximated by the following equation:

$$b = 0.4*(1+u)$$

where u is the proportion of all married women who are currently using contraception (Bongaarts & Potter 1983, p. 85). Cc*Ca is the proportion by which the TM is smaller than TN due to the use of contraception and induced abortion.

Cc*Ca=TM/TN, where TN is total natural fertility

The index of postpartum insusceptibility, Ci, is given by:

Ci= 20/(18.5+i) (Bongaarts & Potter 1983, p. 86)

where 20 is the estimated birth interval in months; 18.5 is the average birth interval in months in the presence of breastfeeding and postpartum abstinence and i is the average duration of postpartum insusceptibility caused by breastfeeding or postpartum abstinence.

$$Ci = TN/TF,$$

where TF is the total fecundity and Ci is the proportion by which TN is smaller than TF due to insusceptibility.

Data selected for analysis

Most of the information, required in calculating the indices corresponding to the proximate determinants, is available from the 2003 Reproductive Health Survey report or calculated from its raw data. The only information missing is that on postpartum abstinence. Although the relevant questions on abstinence were included in the survey, data on abstinence have not been included in the raw dataset. As mentioned earlier, information on the average durations of abstinence and amenorrhea is needed for calculating the average duration of postpartum insusceptibility i, which, in turn, is used for calculating the index of postpartum insusceptibility Ci. Therefore, in the absence of data on abstinence, this study uses the mean duration of postpartum amenorrhea to estimate the average duration of postpartum insusceptibility, although it is recognized that this would somewhat under-estimate postpartum insusceptibility. However, since the purpose of this paper is to find out the extent to which each of the major proximate determinants affects fertility of women with different background characteristics, any possible underestimation of postpartum insusceptibility is not expected to affect the results significantly. It may be mentioned here that the duration of amenorrhea can be estimated from data on breastfeeding, but information on breastfeeding is not considered reliable. On the other hand, information on the duration of amenorrhea is likely to be better reported than the duration of breastfeeding. The mean duration of postpartum amenorrhea for the last births since 1998 has been taken as the mean duration of postpartum insusceptibility in this analysis, since it is considered that the accuracy of the reporting of the duration of amenorrhea for only the last births since 1998 is much better.

Appendix 1 summarizes all the data required for calculating the TFR using the Bongaarts model and their variations by various background characteristics. The estimation of Cm from the proportions currently married is provided in Appendix 2.

The average use-effectiveness of contraception, e, is estimated as the weighted average of the method specific use-effectiveness levels, e(m), with the weights equal to the proportion of women using a given method, u(m):

$$e=(\Sigma e(m)*u(m))/u$$

where u is prevalence of contraception among married women (Bongaarts & Potter 1983, p. 84).

The method specific use-effectiveness ranges from 1.0 for sterilization to 0.5 for traditional methods of contraception (Policy Project 2007). However, the average use-effectiveness of traditional methods depends on the specific method, as well as on how consistently and correctly women use the method to control their fertility. For instance, the observed average use effectiveness of periodic abstinence, which is the dominant traditional method used by Mongolian women, is 0.87 (Bongaarts & Potter 1983, p.70). Furthermore, it can be assumed that the more educated and urban women, as well as women with higher income levels use the traditional method more effectively compared to their counterparts from rural areas, and those with less education and income,

This assumption is related to women's status, which is quite high in Mongolia, particularly among the urban, educated and high income women. Therefore, in the calculation of the average use-effectiveness of contraception, the method specific use-effectiveness of traditional contraceptives has been selected differently, by using interpolation for women with different background characteristics. The calculation of the average use-effectiveness of contraception for all groups of women under study is provided in Appendix 3.

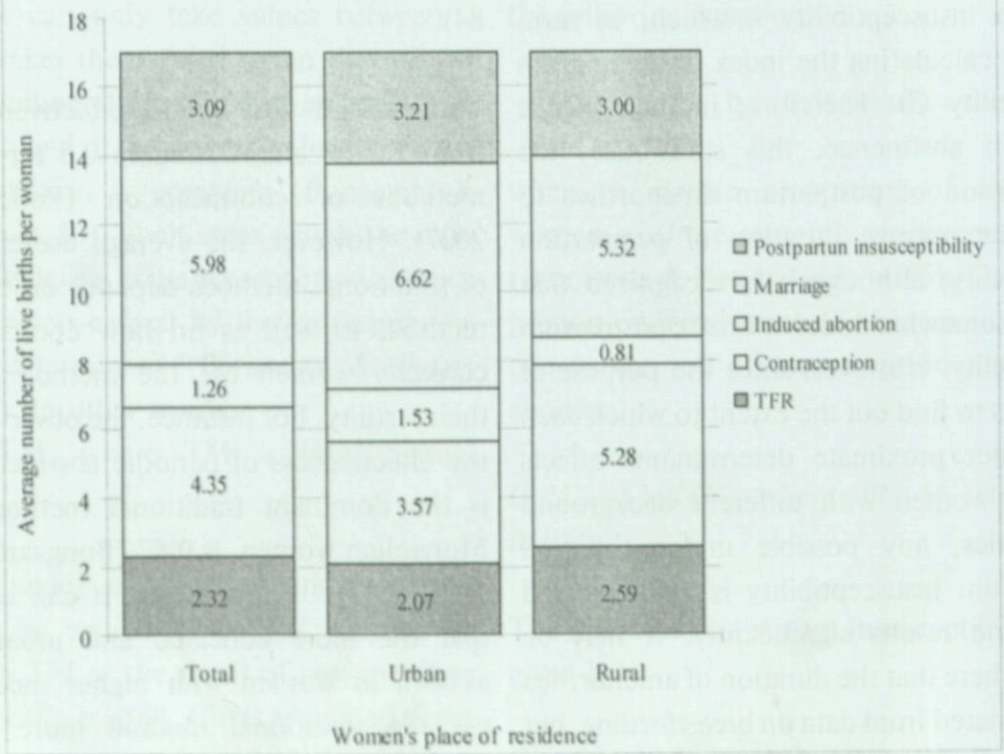
The estimated total abortion rate is very high in Ulaanbaatar at 0.90 abortions per woman of reproductive age, but this indicator is lower in the provincial centers and declines significantly for the *Som* centers and remote rural areas (Appendix 4). In his study on induced abortion in Mongolia, Pandey (2002, p. 96) has also revealed that the abortion ratio was highest in Ulaanbaatar and lowest in the remote rural areas. He explained it by the fact that there are more facilities for abortion available in Ulaanbaatar and the provincial centers, compared to the remote rural areas.

Fertility inhibiting effects of the major proximate determinants

The calculated indices of the proximate determinants and the corresponding estimation of total fertility rates for the total population and for the various groups of population are summarized in Appendix 1. The total fecundity in Mongolia is assumed to be 17 children per woman (i.e., at the high end of the range 15-17), because by using lower values of TF in the Bongaarts model produce values of TFR which are lower than those reported in the 2003 Survey report.

The estimation of the individual effects of the major proximate determinants on the TFR is shown in Figure 1, which illustrates the extent of the effects of each proximate determinant on the total fertility rate at the national level, as well as by place of residence.

Figure1. Contribution of the proximate determinants to TFR, at national level and by place of residence, Mongolia 2003



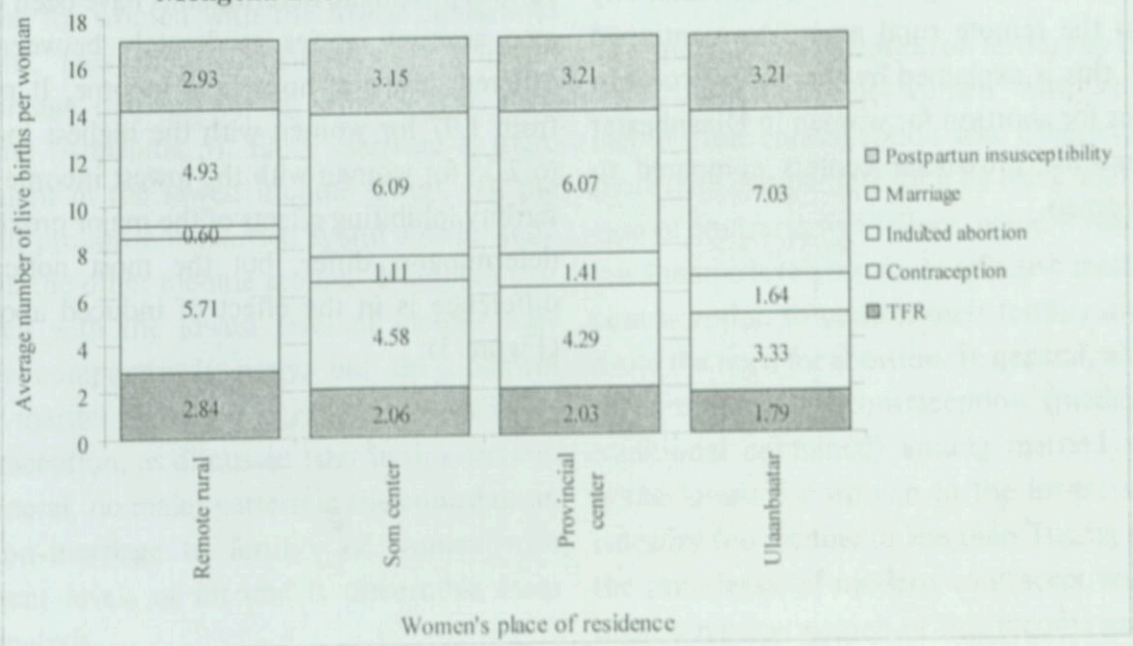
Source: Computed by the author from the 2003 Survey (NSO & UNFPA 2004)

The contribution of non-marriage is significant at the national level, reducing the assumed total fecundity of 17 by 6 live births or by 35 percent on average. This effect of non-marriage is more pronounced in the urban areas, reducing the total fecundity by 39 percent, compared to rural areas where the percentage contribution to TFR of non-marriage is 31 percent. Overall, non-marriage is the largest fertility inhibiting factor for Mongolian women.

The proximate determinant with the next largest contribution to fertility in Mongolia is contraception. At the national level, this proximate determinant reduces the total fecundity of women by more than 25 percent. However, this indicator has a significant variation between rural and urban women. Contraceptive use reduces the total fecundity of urban woman by an average of 3.6 children, whereas for rural women contraception reduces the total fecundity by 5.3 children on average. Thus, due to the greater use-effectiveness of modern contraceptives, the fertility inhibiting effect of contraception is higher for rural women, despite the fact that contraceptive prevalence among married women is the same (69%) in both the rural and urban areas. Furthermore, the contribution of abortion to fertility of urban women is almost twice that among rural women.

Urbanisation has played a significant role in the decline of fertility in Mongolia. In order to see the impact of urbanisation on the proximate determinants of fertility, and hence on fertility ultimately, the proximate determinants analysis is expanded by classifying the women's place of residence further into four groups (Figure 2). Figure 2 illustrates that the fertility inhibiting effects of postpartum insusceptibility, marriage and induced abortion increase with increasing levels of urbanisation, whereas the fertility inhibiting effect of contraception declines considerably with urbanisation (Ulaanbaatar is the most urbanised and the remote rural centers are the least urbanised).

Figure2. Contribution of the proximate determinants to TFR, by place of residence, Mongolia 2003



Source: Computed by the author from the 2003 Survey (NSO & UNFPA 2004)

The increasing trend in postpartum insusceptibility with increasing urbanisation is mainly due to the concentration of more educated women in Ulaanbaatar city and the provincial centers, who have longer durations of postpartum amenorrhea. A high and highly significant value of Chi-square (1434.560, p=0.000) shows a very high degree of association between education and place of residence. About 80 percent of Ulaanbaatar city women and more than 70 percent of provincial center women have higher than complete secondary education, while only 37 percent of the remote rural women have such high educational levels.

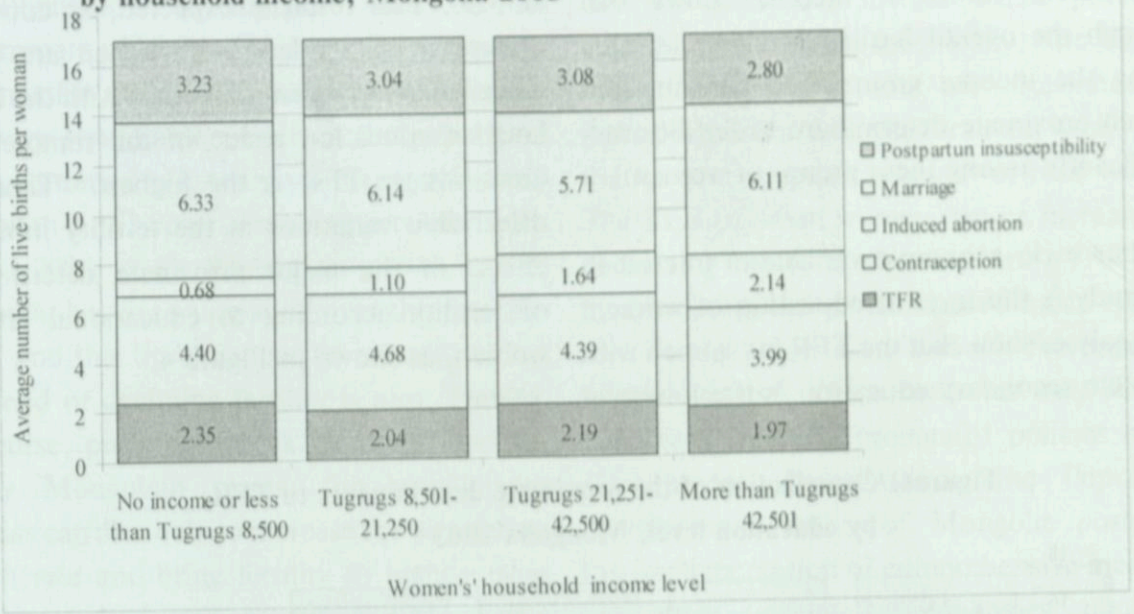
The impact of reducing proportions married on fertility is the largest in Ulaanbaatar city and diminishes as with decreasing urbanisation (Figure 2). This shows that city women postpone their marriages and stay out of a fertile union, as well as control their marital fertility to a much greater extent compared to their counterparts from provincial centers and rural areas.

The contribution of induced abortion on fertility increases significantly with urbanisation. The individual effect of induced abortion on fertility is almost three times greater in Ulaanbaatar city than in the remote rural areas. As mentioned earlier, this is explained by the easier access to facilities for abortion for women in Ulaanbaatar city and the provincial centers compared to rural women.

An unexpected pattern in the contribution of contraception to fertility decline by place of residence is observed in the analysis. The effects of contraception are higher in the remote rural areas and they decrease with increasing levels of urbanisation. This is due to the greater use of traditional methods of contraception (which have lower use-effectiveness than modern contraceptives) by city and provincial women, which can be explained by the fact that the city and provincial center women rely on easier access to abortion services if their contraceptives fail. On the other hand, rural women, particularly nomadic women from remote rural areas do not have easy access to abortion and they control their fertility by using the more effective, longer lasting modern methods of contraception. Thus, the examination of proximate determinants using the Bongaarts framework by place of residence provides a picture of significant disparity in the variables that affect the level of fertility. The overall result is that fertility decreases with increasing urbanisation from the highest TFR in remote rural areas to the lowest TFR in Ulaanbaatar city.

The final value of TFR, after the effects of the various proximate determinants have been taken into account, varies moderately between the different levels of household income. It ranges from 1.97 for women with the highest income to 2.35 for women with the lowest income. The fertility inhibiting effects of the major proximate determinants differ, but the most noticeable difference is in the effect of induced abortion (Figure 3).

Figure3. Contribution of the proximate determinants to TFR, by household income, Mongolia 2003



Source: Computed by the author from the 2003 Survey (NSO & UNFPA 2004)

The analysis shows slightly increasing trend in natural fertility (TN) with increasing levels of household income per person. The higher natural fertility for women with higher levels of household income may be explained by their better nutrition.

The fertility inhibiting effect of marriage is the highest for women with the lowest household income. This may be explained by the lowest percentage married among women with such income (Appendix 5). Early marriage is more prevalent in the lowest income group, but the overall proportions married is still smaller than that in the other income groups. It implies that women with the lowest level of income may marry comparatively early, but they control their marital fertility by using more effective contraception, as discussed later in this section. In general, no major pattern in the contribution of non-marriage to fertility of women with different levels of income is discernible from the analysis.

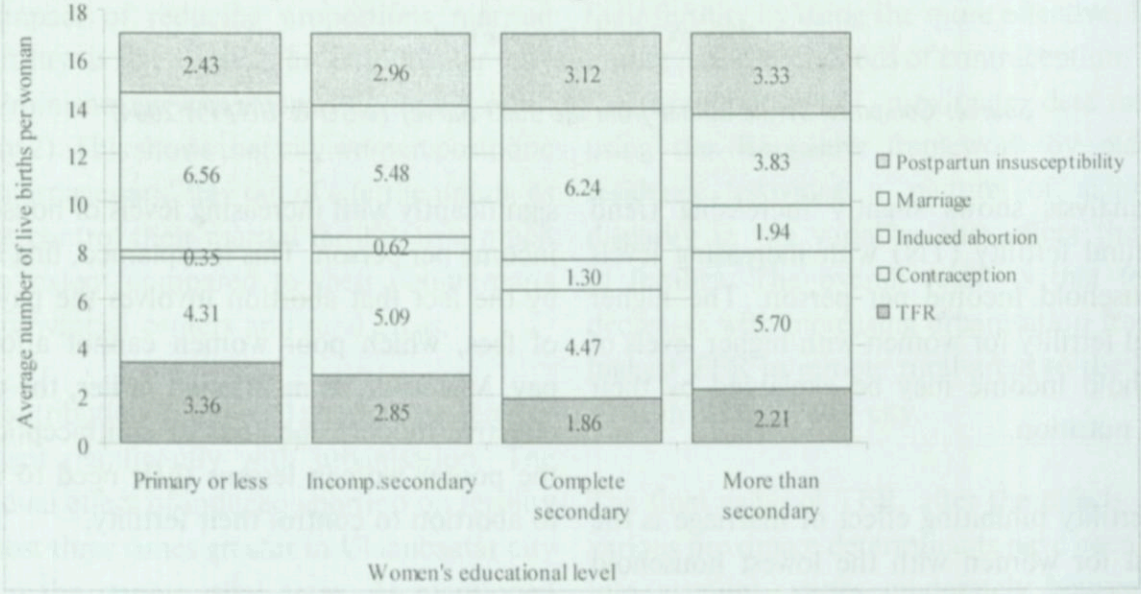
In contrast, the fertility inhibiting effect of induced abortion has a considerable association with the income level of women. It increases significantly with increasing levels of household income per person. This is explained, first of all, by the fact that abortion involves the payment of fees, which poor women cannot afford to pay. Moreover, as mentioned earlier, the use of effective modern methods of contraception by the poorer women lessens their need to resort to abortion to control their fertility.

The effect of contraception on fertility by income levels illustrates that women with sufficient income use contraception less effectively, but more than compensate for it by using abortion in case of contraceptive failure, while women with low income levels use more effective methods of contraception to control their fertility and thus avoid the need for abortion. In general, although the prevalence of contraception (modern and traditional combined) among married women is the lowest for women in the lowest income category (no income or less than Tugrug 8,500), the prevalence of modern contraceptives is the highest among women of this income group.

Hence, the analysis of individual effects of the major proximate determinants on fertility for different levels of income shows that although the overall fertility levels are similar among the income groups, the contributions of each proximate determinant to fertility vary significantly among these groups of women.

Another socio-economic variable of interest in this study is the level of education of women. The analyses show that the TFR for women with complete secondary education is the lowest at 1.86, whilst the TFR for women with primary or less than primary education is the highest at 3.36. This result is expected, as education and place of residence of women are highly associated; 64 percent of women with the lowest level of education reside in the remote rural areas, where TFR is the highest. There are discernible variations in the fertility inhibiting effects of the major proximate determinants of fertility according to educational level of women, as shown in Figure 4.

Figure4. Contribution of the proximate determinants to TFR, by education level, Mongolia 2003



Source: Computed by the author from the 2003 Survey (NSO & UNFPA 2004)

Figure 4 shows that the contribution of postpartum insusceptibility to fertility generally increases with increasing levels of education of women. This trend may be explained by the fact that women with higher levels of education have better breastfeeding practices. The fertility inhibiting effect of non-marriage is less significant for women with more than secondary education (22.5%) and it is highest (38.6%) for women with the lowest level of education.

Moreover, the impact of induced abortion on fertility is seen to increase considerably with the increasing levels of education. The higher educated women tend to control their fertility through induced abortion to a greater extent compared to the women with lower education. The contribution of contraception to fertility is high for women with the highest level of education and low for women with primary or less education. This confirms that women with the highest level of education have the highest marital fertility, but they control it through induced abortion and contraception.

An examination of the roles of the various proximate determinants on fertility demonstrates that level of education is an important socio-economic variable for explaining the fertility differentials among women.

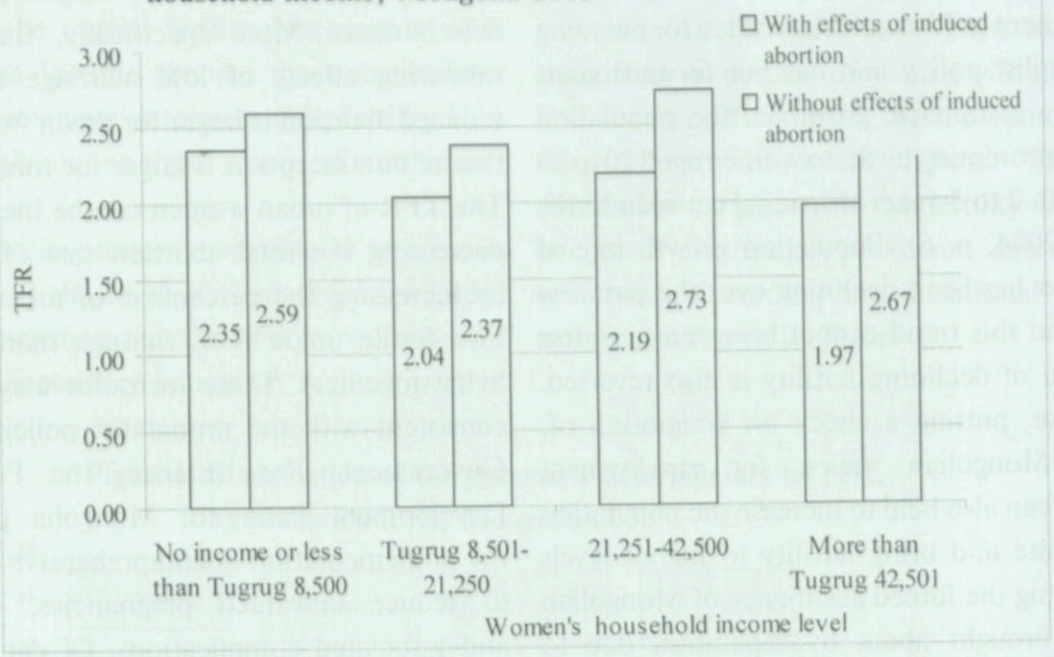
Simulation

The Population Development Policy of the Government of Mongolia has called for pursuing a pronatalist policy and has put forward goals to ensure sustainable growth of the population through promoting births to women aged 20 to 39 years with 2 to 3 years of spacing between births (GOM 2004, p. 6). Population growth rate of Mongolia has been declining over the past few years, and this trend cannot be reversed unless the trend of declining fertility is also reversed. Of course, putting a check on emigration of, mostly Mongolian males, for employment overseas can also help to increase the population growth rate and bring fertility to higher levels by reducing the forced abstinence of Mongolian couples brought about by separation due to emigration. However, the remittances sent by Mongolian workers from overseas are seen as importance sources of revenue, and therefore this option is not really feasible. Moreover, emigration has not reached such volumes as to produce a big impact on fertility. The other migration option for increasing population growth, namely immigration is not an option since the Mongolian economy and the available resources in the country are not conducive to large scale immigration programs. Therefore, considering all possibilities, increasing the fertility of Mongolian women seems to be the only option for sustaining population growth.

An attempt has been made in this section to examine the possible ways of increasing the level of fertility of various groups of women based on the findings of the analyses of fertility inhibiting effects of the major proximate determinants. The analysis of the effects of the major proximate determinants on fertility of women with different background characteristics would suggest possible ways to increase the fertility of particular groups of women, and hence the overall fertility of the country. The examination of TFR by place of residence demonstrates considerable variations due to differences in the major proximate determinants. More specifically, the fertility inhibiting effects of low marriage rates and induced abortion is larger for urban women and that of contraception is larger for rural women. The TFR of urban women can be increased by decreasing the total abortion rate (TAR) and by increasing the percentage of urban women in a fertile union (i.e., through marriage and living together). These measures may be fully consistent with the pronatalist policies of the Government. For instance, the Population Development Policy of Mongolia postulates the implementation of comprehensive measures to reduce unwanted pregnancies, abortions and associated complications. Of course there is a possibility that the couples might become motivated to use more effective methods of contraception and less abortion. Furthermore, as mentioned before, the Government provides newly married couples with 500,000 Tugrugs (equivalent to 455 USD) as one time support for family building.

Therefore, if the total abortion rate and the percentage of women in a fertile union among urban women were brought to the same level as that of their rural counterparts, the TFR for urban women could increase from 2.07 to 2.84. It is possible to carry out similar simulations with other groups of women to demonstrate potential increases in fertility in Mongolia. For instance, the removal of the effects of abortion on fertility of women with more than secondary education would increase the TFR for these groups of women from 2.21 to 2.75. Figure 5 shows a comparison of the TFR with and without the effects of induced abortion by income group.

Figure5. TFR in the presence and absence of effects of induced abortion by household income, Mongolia 2003



Source: Computed by the author from the 2003 Survey (NSO & UNFPA 2004)

This shows that avoidance of induced abortions by women will increase the fertility levels considerably. However, if the desired family size is still below that achieved, then there is the very real possibility they will just turn to more effective methods of modern contraception.

Summary

Examination of the effects of the major proximate determinants of fertility in Mongolia, using the Bongaarts framework reveals that fertility levels of women with different background characteristics vary significantly due to variations in the proximate determinants.

Overall, the fertility level in Mongolia is largely influenced by a decline in the proportions married among women of reproductive age, the individual effect of which is to reduce the total fecundity by 6.0 live births per woman. The next largest contributor to the decline of total fecundity (TF) is current use of contraception, the individual effect of which is to reduce the TF by 4.35 live births per woman. However, as mentioned earlier, the total abortion rate (TAR) is relatively high in Mongolia. The analysis shows that women who fail to use effective methods of contraception are likely to control their fertility through induced abortion.

Furthermore, it has been observed that although the ultimate fertility levels of the various groups of women, resulting from the overall effects of all the proximate determinants, are relatively similar to each other, the analysis has shown that there are variations in the extent to which each proximate determinant has affected the fertility of specific groups.

Possible changes in one or more of the proximate determinants could lead to significant increases in fertility. This provides important messages for policy makers. On the whole, analysis of the major proximate determinants on fertility in Mongolia demonstrates that an increase in the proportions married among all women, particularly among urban and city women,

and a decline in induced abortion could significantly increase fertility level in Mongolia.

It is important to note that due to the absence of data on postpartum abstinence, the TFR might have been overestimated by the proximate determinants model, even though the estimated values of the TFR are very close to the TFR estimated in the 2003 Survey report for various groups of women, particularly, for the total population. Moreover, the observed patterns obtained from the proximate determinants model are consistent with the relationships between the proximate determinants and socio-economic variables, obtained in the bivariate analysis.

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Appendix 1. Proximate determinants of fertility, Mongolia 2003

Women's social characteristics	The index of marriage **Cm**	Prevalence of contraception among married women **u**	Average use-effectiveness **e**	The index of contraception **Ce**	Average number of births averted per induced abortion **b**	TFR	TAR	The index of induced bortion **Ca**	Mean duration of stpartum cnorrhea	The index of postpartum nsusceptibility **Ci**	TFR ongaarts)
Total	0.57	0.69	0.88	0.35	0.676	2.50	0.70	0.84	5.95	0.82	2.32
Urban	0.52	0.69	0.84	0.37	0.678	2.14	0.86	0.79	6.16	0.81	2.07
Rural	0.62	0.69	0.91	0.33	0.674	2.89	0.44	0.91	5.78	0.82	2.59
Ulaanbaatar	0.49	0.69	0.88	0.35	0.675	1.90	0.90	0.76	6.16	0.81	1.79
Provincial center	0.56	0.70	0.89	0.32	0.681	2.45	0.80	0.82	6.15	0.81	2.03
Som center	0.56	0.70	0.91	0.31	0.682	2.60	0.64	0.86	6.05	0.81	2.06
Remote rural	0.65	0.67	0.92	0.33	0.670	3.06	0.32	0.93	5.66	0.83	2.84
No income or less than Tugrug 8,500	0.54	0.66	0.91	0.35	0.664	2.70	0.41	0.91	6.2	0.81	2.35
Tugrug 8,501-21,250	0.56	0.70	0.92	0.30	0.681	2.55	0.61	0.86	5.86	0.82	2.04
Tugrug 21,251-42,500	0.59	0.70	0.88	0.33	0.682	2.41	0.88	0.80	5.92	0.82	2.19
More than Tugrug 42,501	0.57	0.68	0.91	0.33	0.672	2.21	1.18	0.74	5.44	0.84	1.97
Primary or less education	0.55	0.56	0.93	0.44	0.624	3.17	0.23	0.96	4.83	0.86	3.36
Incomplete secondary education	0.61	0.63	0.94	0.36	0.653	2.75	0.33	0.93	5.71	0.83	2.85
Complete secondary	0.55	0.72	0.91	0.29	0.688	2.37	0.71	0.83	6.00	0.82	1.86
More than secondary education	0.72	0.72	0.92	0.28	0.689	2.42	0.86	0.80	6.38	0.80	2.21

Source: Computed from 2003 Survey (NSO & UNFPA 2004)

Appendix 2. Index of marriage, Cm, Mongolia 2003

Women' social characteristics	Age group	Total number of women	Number of married women	Age-specific propotion of married m(a)	ASFR	Age specific marital fertility rate g(a)	m(a)*g(a)	C(m)
Total	15-19*	1 347	77	0,057	17,07	204,1	11,67	**0,57**
	20-24	1 420	800	0,563	153,29	272,1	153,29	
	25-29	1 509	1 220	0,808	156,39	193,4	156,39	
	30-34	1 520	1 317	0,866	99,34	114,7	99,34	
	35-39	1 428	1 251	0,876	55,09	62,9	55,09	
	40-44	1 276	1 064	0,834	15,15	18,2	15,15	
	45-49	814	616	0,757	1,23	1,6	1,23	
Urban	15-19	803	29	0,036	9,55	190,5	6,88	**0,52**
	20-24	728	353	0,485	123,17	254,0	123,17	
	25-29	731	552	0,755	134,97	178,7	134,97	
	30-34	777	635	0,817	85,80	105,0	85,80	
	35-39	784	669	0,853	52,30	61,3	52,30	
	40-44	682	545	0,799	13,69	17,1	13,69	
	45-49	468	352	0,752	0,71	0,9	0,71	
Rural	15-19	544	48	0,088	28,19	214,8	18,95	**0,62**
	20-24	692	447	0,646	184,97	286,4	184,97	
	25-29	778	668	0,859	176,52	205,6	176,52	
	30-34	743	682	0,918	113,50	123,7	113,50	
	35-39	644	582	0,904	58,49	64,7	58,49	
	40-44	594	519	0,874	16,84	19,3	16,84	
	45-49	346	264	0,763	1,93	2,5	1,93	
Ulaanbaatar	15-19	515	19	0,037	7,77	180,8	6,67	**0,49**
	20-24	501	224	0,447	107,78	241,1	107,78	
	25-29	433	320	0,739	123,94	167,7	123,94	
	30-34	439	341	0,777	72,89	93,8	72,89	
	35-39	412	340	0,825	50,16	60,8	50,16	
	40-44	404	315	0,780	15,68	20,1	15,68	
	45-49	303	226	0,746	0,00	0,0	0,00	
Provincial center	15-19	288	10	0,035	12,73	207,4	7,20	**0,56**
	20-24	227	129	0,568	157,12	276,5	157,12	
	25-29	298	232	0,779	151,01	194,0	151,01	
	30-34	338	294	0,870	102,56	117,9	102,56	
	35-39	372	329	0,884	54,66	61,8	54,66	
	40-44	278	230	0,827	10,79	13,0	10,79	
	45-49	165	126	0,764	2,02	2,6	2,02	
Som center	15-19	225	5	0,022	5,93	227,0	5,04	**0,56**
	20-24	161	87	0,540	163,56	302,7	163,56	
	25-29	222	186	0,838	169,67	202,5	169,67	
	30-34	287	262	0,913	103,37	113,2	103,37	
	35-39	297	275	0,926	58,36	63,0	58,36	
	40-44	281	237	0,843	18,98	22,5	18,98	
	45-49	144	108	0,750	0,00	0,0	0,00	
Remote rural area	15-19	319	43	0,135	43,89	211,8	28,55	**0,65**
	20-24	531	360	0,678	191,46	282,4	191,46	
	25-29	556	482	0,867	179,26	206,8	179,26	

	30-34	456	420	0,921	119,88	130,2	119,88	
	35-39	347	307	0,885	58,60	66,2	58,60	
	40-44	313	282	0,901	14,91	16,5	14,91	
	45-49	202	156	0,772	3,30	4,3	3,30	
No income or less than Tugrug 8,500	15-19	417	29	0,070	23,18	240,9	16,76	**0,54**
	20-24	386	193	0,500	160,62	321,2	160,62	
	25-29	411	317	0,771	178,43	231,3	178,43	
	30-34	447	370	0,828	124,53	150,5	124,53	
	35-39	447	382	0,855	71,59	83,8	71,59	
	40-44	386	308	0,798	23,32	29,2	23,32	
	45-49	231	156	0,675	2,89	4,3	2,89	
Tugrug 8,501-21,250	15-19	558	27	0,048	17,32	210,0	10,16	**0,56**
	20-24	598	344	0,575	161,09	280,0	161,09	
	25-29	649	531	0,818	155,11	189,6	155,11	
	30-34	626	551	0,880	93,72	106,5	93,72	
	35-39	601	528	0,879	49,92	56,8	49,92	
	40-44	533	456	0,856	12,51	14,6	12,51	
	45-49	312	236	0,756	1,07	1,4	1,07	
Tugrug 21,251-42,500	15-19	256	17	0,066	13,02	180,3	11,98	**0,59**
	20-24	329	201	0,611	146,91	240,5	146,91	
	25-29	325	270	0,831	141,54	170,4	141,54	
	30-34	315	280	0,889	92,06	103,6	92,06	
	35-39	274	246	0,898	46,23	51,5	46,23	
	40-44	249	207	0,831	14,73	17,7	14,73	
	45-49	184	150	0,815	0,00	0,0	0,00	
More than Tugrug 42,501	15-19	115	3	0,026	2,90	133,1	3,47	**0,57**
	20-24	107	62	0,579	102,80	177,4	102,80	
	25-29	122	101	0,828	125,68	151,8	125,68	
	30-34	131	115	0,878	55,98	63,8	55,98	
	35-39	106	95	0,896	37,74	42,1	37,74	
	40-44	108	93	0,861	0,00	0,0	0,00	
	45-49	87	74	0,851	0,00	0,0	0,00	
Primary or less education	15-19	431	32	0,074	28,62	216,1	16,05	**0,55**
	20-24	261	155	0,594	171,14	288,2	171,14	
	25-29	80	57	0,713	204,17	286,5	204,17	
	30-34	50	35	0,700	100,00	142,9	100,00	
	35-39	65	52	0,800	61,54	76,9	61,54	
	40-44	120	97	0,808	19,44	24,1	19,44	
	45-49	125	82	0,656	2,67	4,1	2,67	
Incomplete secondary education	15-19	595	22	0,037	9,52	210,0	7,76	**0,61**
	20-24	313	206	0,658	184,24	279,9	184,24	
	25-29	478	404	0,845	168,06	198,8	168,06	
	30-34	253	220	0,870	135,70	156,1	135,70	
	35-39	243	212	0,872	53,50	61,3	53,50	
	40-44	240	199	0,829	18,06	21,8	18,06	
	45-49	158	123	0,778	2,11	2,7	2,11	
Complete secondary education	15-19	313	23	0,073	14,91	202,5	14,88	**0,55**
	20-24	541	263	0,486	131,24	270,0	131,24	
	25-29	446	367	0,823	151,72	184,4	151,72	
	30-34	532	465	0,874	93,36	106,8	93,36	
	35-39	378	331	0,876	64,37	73,5	64,37	
	40-44	243	207	0,852	13,72	16,1	13,72	
	45-49	117	84	0,718	0,00	0,0	0,00	

More than secondary education	15-19	8	0	0,000	41,67	0,0	0,00	**0,72**
	20-24	305	176	0,577	145,36	251,9	145,36	
	25-29	505	392	0,776	141,91	182,8	141,91	
	30-34	685	597	0,872	90,51	103,9	90,51	
	35-39	742	656	0,884	50,31	56,9	50,31	
	40-44	673	561	0,834	13,87	16,6	13,87	
	45-49	414	327	0,790	0,81	1,0	0,81	

Source: Computed from 2003 Survey (NSO & UNFPA 2004)
* g(15-19)=0.75*g(20-24), because married women in the 15-19 age group are mostly aged 18 or 19, and therefore, they are not representative of the entire age group (Bongaarts & Potter 1983, pp.81-82).

Appendix 3. Average use-effectiveness of contraceptives, Mongolia 2003

Methods of contraceptives	Percentage of married women using specific method of contraception														Method specific use-effectiveness e(m)
	Total	Urban	Rural	Ulaanbaatar	Provincial center	*Som* center	Remote rural area	No income or less than Tugrug 8,500	Tugrug 8,501-21,251	Tugrug 21,251-42,500	More than Tugrug 42,501	Primary or less education	Incomplete secondary education	Complete secondary education	More than secondary education	
Condom	5,42	6,70	4,17	6,50	6,96	5,86	3,22	4,56	5,05	6,86	6,45	2,94	3,68	5,40	6,79	0,81
Female sterilization	2,99	3,41	2,59	2,80	4,22	2,93	2,39	3,42	3,37	2,41	1,29	3,33	2,45	2,93	3,25	1,00
Injectable	5,78	4,37	7,17	3,47	5,56	8,36	6,49	7,01	6,51	3,79	3,31	6,27	6,20	6,38	5,09	1,00
IUD	32,78	28,71	36,76	27,68	30,07	31,72	39,61	35,95	34,39	29,18	23,76	31,57	38,38	35,46	28,42	0,96
Norplant	0,28	0,22	0,34	0,17	0,30	0,09	0,49	0,46	0,19	0,22	0,37	0,59	0,22	0,23	0,30	1,00
Pill	10,97	11,07	10,87	10,48	11,85	12,24	10,10	9,29	10,85	12,91	11,97	8,24	8,23	12,36	12,00	0,92
Traditional	10,58	14,74	6,51	17,42	11,19	9,05	5,07	5,13	9,88	14,95	20,63	3,14	4,11	9,08	16,24	0.5-0.87*
Other	0,16	0,19	0,12	0,22	0,15	0,17	0,10	0,23	0,11	0,15	0,18	0,00	0,07	0,11	0,26	0,50
Total	68,97	69,41	68,54	68,74	70,30	70,43	67,46	66,04	70,36	70,46	69,96	56,08	63,35	71,95	72,35	
Average use-effectiveness	0,88	0,84	0,91	0,88	0,89	0,91	0,92	0,91	0,92	0,88	0,91	0,93	0,94	0,91	0,92	

Source: Computed from 2003 Survey (NSO & UNFPA 2004)
*The method specific use-effectiveness for traditional method of contraceptives varies from 0.5 to 0.87 depending on the proportion of periodic abstinence within total traditioanl method and the women's background characteristics.

Appendix 4. ASAR and TAR, Mongolia 1998-2003

Women' social characteristics	Age group	Total number of women	Total number of abortions	Total number of abortions a year	ASAR	TAR
Total	15-19	1 347	4	0,8	0,59	**0,66**
	20-24	1 420	86	17,2	12,11	
	25-29	1 509	185	37	24,52	
	30-34	1 520	263	52,6	34,61	
	35-39	1 428	224	44,8	31,37	
	40-44	1 276	148	29,6	23,20	
	45-49	814	23	4,6	5,65	
Urban	15-19	803	2	0,4	0,50	**0,86**
	20-24	728	61	12,2	16,76	
	25-29	731	124	24,8	33,93	
	30-34	777	183	36,6	47,10	
	35-39	784	152	30,4	38,78	
	40-44	682	96	19,2	28,15	
	45-49	468	17	3,4	7,26	
Rural	15-19	544	2	0,4	0,74	**0,44**
	20-24	692	25	5	7,23	
	25-29	778	61	12,2	15,68	
	30-34	743	80	16	21,53	
	35-39	644	72	14,4	22,36	
	40-44	594	52	10,4	17,51	
	45-49	346	6	1,2	3,47	
Ulaanbaatar	15-19	515	1	0,2	0,39	**0,90**
	20-24	501	46	9,2	18,36	
	25-29	433	83	16,6	38,34	
	30-34	439	109	21,8	49,66	
	35-39	412	79	15,8	38,35	
	40-44	404	53	10,6	26,24	
	45-49	303	14	2,8	9,24	
Provincial center	15-19	288	1	0,2	0,69	**0,80**
	20-24	227	15	3	13,22	
	25-29	298	41	8,2	27,52	
	30-34	338	74	14,8	43,79	
	35-39	372	73	14,6	39,25	
	40-44	278	43	8,6	30,94	
	45-49	165	3	0,6	3,64	
Som center	15-19	225	0	0	0,00	**0,64**
	20-24	161	8	1,6	9,94	
	25-29	222	34	6,8	30,63	
	30-34	287	42	8,4	29,27	
	35-39	297	49	9,8	33,00	
	40-44	281	30	6	21,35	
	45-49	144	3	0,6	4,17	
Remote rural area	15-19	319	2	0,4	1,25	**0,32**
	20-24	531	17	3,4	6,40	
	25-29	556	27	5,4	9,71	
	30-34	456	38	7,6	16,67	
	35-39	347	23	4,6	13,26	

	40-44	313	22	4,4	14,06	
	45-49	202	3	0,6	2,97	
No income or less than Tugrug 8,500	15-19	417	1	0,2	0,48	**0,41**
	20-24	386	17	3,4	8,81	
	25-29	411	30	6	14,60	
	30-34	447	44	8,8	19,69	
	35-39	447	40	8	17,90	
	40-44	386	33	6,6	17,10	
	45-49	231	5	1	4,33	
Tugrug 8,501-21,250	15-19	558	1	0,2	0,36	**0,61**
	20-24	598	33	6,6	11,04	
	25-29	649	72	14,4	22,19	
	30-34	626	109	21,8	34,82	
	35-39	601	98	19,6	32,61	
	40-44	533	52	10,4	19,51	
	45-49	312	3	0,6	1,92	
Tugrug 21,251-42,500	15-19	256	1	0,2	0,78	**0,88**
	20-24	329	27	5,4	16,41	
	25-29	325	48	9,6	29,54	
	30-34	315	60	12	38,10	
	35-39	274	63	12,6	45,99	
	40-44	249	44	8,8	35,34	
	45-49	184	9	1,8	9,78	
More than Tugrug 42,501	15-19	115	1	0,2	1,74	**1,18**
	20-24	107	9	1,8	16,82	
	25-29	122	35	7	57,38	
	30-34	131	50	10	76,34	
	35-39	106	23	4,6	43,40	
	40-44	108	19	3,8	35,19	
	45-49	87	2	0,4	4,60	
Primary or less education	15-19	431	3	0,6	1,39	**0,23**
	20-24	261	4	0,8	3,07	
	25-29	80	0	0	0,00	
	30-34	50	3	0,6	12,00	
	35-39	65	4	0,8	12,31	
	40-44	120	7	1,4	11,67	
	45-49	125	3	0,6	4,80	
Incomplete secondary education	15-19	595	0	0	0,00	**0,33**
	20-24	313	14	2,8	8,95	
	25-29	478	34	6,8	14,23	
	30-34	253	15	3	11,86	
	35-39	243	11	2,2	9,05	
	40-44	240	21	4,2	17,50	
	45-49	158	3	0,6	3,80	
Complete secondary education	15-19	313	1	0,2	0,64	**0,71**
	20-24	541	38	7,6	14,05	
	25-29	446	67	13,4	30,04	
	30-34	532	91	18,2	34,21	
	35-39	378	57	11,4	30,16	
	40-44	243	34	6,8	27,98	
	45-49	117	3	0,6	5,13	