FERTILITY IN KYRGYZSTAN: INDIVIDUAL FEMALE CHARACTERISTICS

by

Kanimet Isabekov

Submitted to

Central European University

Department of Economics

In partial fulfillment of the requirements for the degree of

Master of Economic Policy in Global Markets

Supervisor: Peter Mihalyi

Budapest, Hungary

2016

Abstract

There is a large literature on fertility determinants. Mostly negative associations between income and fertility as well as negative education-fertility correlations were found in many countries. The main purpose of research is to identify the main characteristics of women aged from 15 to 49 who are able to give a birth or already have children and also to measure the magnitude of these characteristics. Kyrgyz Integrated Household Survey data for period of years 2005-2012 was used for analysis under fixed effects estimation method. Actual number of children a woman has given birth to was taken as a dependent variable. Results have shown that females who have more children are coming from relatively poor families, reside in rural areas and have low level of education. Possible policy targets were suggested.

Table of Contents

1 Introduction

Fertility is usually high in poor countries within a society, and among countries with higher average income fertility is low. While fertility rate of Kyrgyzstan equaled 5 in 1960s, today it is three children per woman in average. The aim of the thesis is to define the main characteristics of women associated to fertility behavior.

One can find a lot of recent research on fertility determinants. The main reason of such investigations is demand from policy-makers of a country which faced a sharp increase or decrease in fertility trends. One can find very few research done on fertility behavior done in Kyrgyzstan, thus current study is being an important academic input. Going back to theory provided by Becker (1960) one can find that fertility behavior can be based on quantity-quality trade-off for children. Richer families are usually more educated and prefer to invest more in child quality (education, health services, and extracurricular activities) rather than in child quantity, while poorer families do not simply have enough resources and education to be willing to invest in child quality, thus they have more children. Weak education can also be correlated with poor knowledge of pregnancy prevention tools and importance. Many scientific studies also show an evidence for rural area residents having more children when compared to urban residents. Based on these I built three main hypotheses: income is inversely correlated with number of children in family; education is negatively associated with number of children in a family; and rural residents have more children comparing to urban residents.

Using Kyrgyz Integrated Household Survey for period 2005-2012 I constructed panel data model and investigated relationship between female fertility (number of births given by a female) and different individual and household characteristics in order to testify the hypotheses built. Using Fixed Effects estimation technique I received results on fertility-income and fertility-education correlation and using OLS regression I identified association between area of residence and number of children born by a female (fertility). All three hypotheses based on

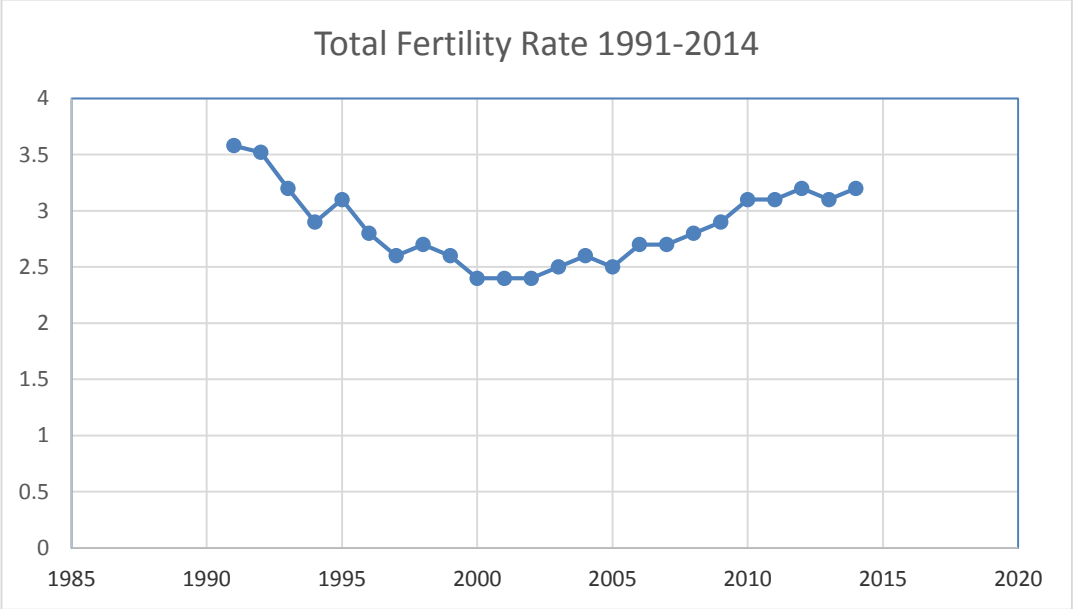
scientific literature and theoretical background were justified by results. Indeed females who have more children are coming from poor, less educated families residing in rural areas. High fertility in rural areas is considered as a signal of weak education levels. Policy makers should attract more resources and spending on education development in rural areas to change fertility behavior of people: families should get enough education to be willing to increase the quality of children rather than quantity. Whole country will benefit from this policy.

Structure of this paper is organized as follows. First I proved a brief overview of fertility factor in Kyrgyzstan in demographical frames. Purpose of the overview is to introduce real and historical numbers concerning fertility in Kyrgyzstan to reader. Then all empirical and theoretical literature is presented and analyzed. Further I proceed with theoretical background and hypotheses to be tested. Last two chapters are empirical framework and concluding remarks. Empirical framework consists of data description, variables description, methodology, estimation technique and results interpretation. Concluding remarks include summary of results, contribution of paper and policy recommendation.

2 Brief overview of fertility in Kyrgyzstan

During the years of independent development of Kyrgyzstan, there have been significant structural changes in economic and social spheres. In the course of reforms in Republic of the early and mid -1990s, who carried with them both positive and negative changes, there were changes in the demographic sphere - the number of population, education, fertility, life expectancy and migration. Population in the country is represented mainly by such national groups as Kyrgyz (69.2 percent) , Uzbeks (14.5 percent) , Russian (8.7 percent) and other nationalities (7.6 percent). Population of Kyrgyzstan for 1966-1990 years increased 1.65 times and for 1990-2015 increased 1.36 times (World Bank). As the world fertility rate has declined from 4.9 in 1960 to 2.5 in 2008, fertility in Kyrgyzstan also experienced changes. Fertility rate of 1960s which was 5.17 births in average per woman fell down till 3.67 after collapse of USSR in1990, then till 2.5 in 2005 and till 3.2 in 2014. These can be seen from Graph 1 below made by World Bank.

Graph 1



These changes are explained by different socio-economic reasons starting from the first day of Kyrgyzstan independence. In times of Soviet Union the social welfare was more

developed and lots of services like schools, hospital and kindergartens were for free, which in turn encouraged families to have more children. After collapse of USSR, market economy has come and lots of services became payable, unemployment rose and sharp decrease in economic and social welfare was noticed. Birth rate varies depending on the type of community and the region. Women in urban areas have an average of 3 children, whereas in rural areas the share of each woman falls to 4 children. The highest birth rate recorded in Talas, where women have an average of 4.8 children, the lowest in the city of Osh - 2.7 children. Total fertility rate according to the average number of births per woman in Bishkek - 2.9 , in Chui oblast - 3.3 , Issyk-Kul oblast - 4.2 , Naryn oblast - 4.5 , Jalal- Abad region - 4 , Osh oblast - 3.7 , Batken oblast - 4.4 children .

Birth rate also varies depending on the mother's education level and economic status of the family. Women with higher education have an average of more than 3.2 children, while women with a basic general education - 3.7 children, and women with complete secondary or professional primary / secondary education have an average of 4 children. Fertility increases with a decrease in the level of household wealth. Women from the poorest households have an average of 4 children, while the wealthiest women on average have only about 2.7 children. The total fertility rates of three ethnicities in Kyrgyzstan – Kyrgyz, Uzbeks, and Russians – in 2009 were 2.92, 3.08, and 1.57 children per female, correspondingly.

3 Literature review

The literature about fertility and its determinants is divided into two directions: determinants of fertility and effect of income on fertility. There were different countries where this topic was investigated: mainly it is about Northern America, Asia, Europe and Australia. Declining fertility is a global phenomenon. Increasing the productive value of time of woman spent outside of house, usually measured by the wage rate they receive or by their schooling, raises the opportunity cost of having a child, and as a consequence parents want to have fewer children, despite the offsetting effect coming from an increase in their incomes (P. Schultz, 1985).

Lots of articles find that the female wage is an important determinant of fertility rate. Before presenting the literature review, I would like to mention some analysis on researches made on wages and fertility effects. This literature on wages and fertility includes several features in common:

• Female wages are commonly tended to be negatively related and affect significantly. A one percent increase in women's wages is likely to decrease female fertility from one to three percent

• Male income affects generally in a positive and significant way. One percent increase in male's wage usually increases fertility by one to two percent.

• If men's and women's incomes are included in a single model, the empirical coefficient before females' incomes are often bigger than the multiplier before variable of males' wage.

•Also, findings let us understand the importance of relative wages which is calculated by dividing woman's earning by man's. If the female starts to earn more than man, relatively, fertility rate tends to decrease.

Nevertheless, some contradicting and conforming factors exist:

•Some articles do not really find the variable of males' or man's wage as a significant one. Also, if some economic hypotheses were built, in the result, the coefficients of variables and signs of relationships to fertility had a strangely reversed signs. (Tasiran, 1996, Del Boca, 2002)

Also, some researchers found that determinants of fertility can vary because of counting fertility itself. For example: women's wage can be negatively related to the birth of the first children, but the effect is insignificant on the birth of third or fourth baby.

Findings also are different in terms of countries. In 1990 a hazard life-cycle fertility model was explored by Heckman and Walker in their own research on effect of wages on fertility. When the research was made in Sweden, women's wage was negatively related to fertility (Heckman and Walker, 1990). However, when the same model was used in order to estimate fertility determinant in USA, women's income was pretty significant and positive (Tasiran, 1996).

Literature on the effect of the women's income on fertility will be divided by results: negative, positive, insignificant and others.

Almost all papers justified the hypothesis of negative correlation of women's wages and fertility. The more the women work the less time they have for childbearing. Following researchers found that women's income is negative to fertility: Ehrlich and Kim (2007); Heckman and Walker (1990); Hyatt and Milne (1991); McNown and Ridao (2004); Ronsen (2004).

Positive relationship of women's wages and fertility was found in several papers Tasiran (1996); Milligan (2005). All of them were held within different countries and models. Some papers investigated several countries, while others researched only one country within small period of time.

Ehrlich and Kim (2007) did international research in aggregate data from 57 countries. Econometric estimation technique was fixed effect estimator. Dependent variable was taken

total fertility rate. Independent variables were female labor force participation rate, GDP per capita, the marriage rate, government spending as a share of GDP, social security benefits as a share of GDP, the marriage rate, government spending as a share of GDP, the probability of surviving until the age of 24, the female labor force participation rate, and ratio of average schooling years of females to males. Results were following: one percent increase in GDP per capita has negative effect of decreasing total fertility rate from 0.17 percent to 0.31 percent.

Heckman and Walker (1990) took research of Sweden using hazard model of life-cycle fertility using individual level data of year 1981. This model actually measures how transitional probabilities (progressing from one parity to another) behave and changes over time and under effect of different characteristics. The authors estimated 148 different specifications to find the best fitting econometric model and to testify robustness. Transition from one parity to another was considered as dependent variable. As there were no exact data on wages and incomes, it was calculated by dividing total tax paid by time for different sexes and ages. Independent variables include: employment, education, marital status, cohabitation status and social background.

As a result women's wages were consistently found to be a significant and negative determinant of fertility and men's wages were found to be positive and significant. A one percent increase in women's wages decreases the predicted number of children of a woman by the age of 40 by 0.55%. A one percent increase in men's wages increases the predicted number of children his spouse will have by the age of 40 by 0.21%.

Butz and Ward (1979) made investigation on USA fertility. Fertility rates were divided on several age groups and one aggregate group. Authors run simple ordinary least squares estimation. There were two dependent variables: age specific fertility rates and the TFR. The independent variables were: female hourly earnings, male annual earnings, cohort and the fraction of families with employed wives. Conclusion was that one percent increase in

women's hourly earnings was found to decrease the TFR by between 1.59 and 1.85 per cent depending on the type of cohort. Also one percent increase in men's annual earnings turned out to increase total fertility rate by more than 1percent..

Risse (2006) did research of Australia. Estimation technique was probit estimator. Data held individual level information. Probit estimator was used also to avoid potential sample selection biases. The dependent variable was the fact of pregnancy whether a woman had fallen or not. Independent variables included such variables as personal weekly gross wage, work force attachment, industry of employment, education, age, region, and remoteness. Women's wages were explored to be negative and significant. The effect of probability of becoming pregnant in the last year decreases with increasing of the wage.

As the findings were not all the same, along with negative results also there are positive ones. Gauthier and Hatzius (1997) conducted research among 22 OECD countries for period from 1970 to 1990s. Estimation technique was fixed effects because there were only time variant variables only. Dependent variable was the total fertility rate in country and independent variables included men's and women's wages, changes in the unemployment rate, maternity leave entitlements and the ratio of family payments to average weekly earnings. Income was found as a positive related determinant to fertility. A one percent increase in women's average wages was found to increase the total fertility rate by 0.22 per cent in the short run. In the long run, a one percent increase in women's average wages was found to increase the total fertility rate by around 1.7 per cent. Men's wages in long run were insignificant.

Tasiran (1996) investigated two countries: Sweden and the U.S.A. He used hazard lifecycle model to regress income on fertility. The dependent variables included three types: first childbirth, second and third. The independent variables were: age, education, male and female wages, benefits. Actually effect of income on childbirth differed between USA and

Sweden. In the USA increasing women's wages was related in a positive sign for effect on first, second and third births. In Sweden, increasing female's wages were found to have a positive effect on the first birth, an insignificant effect on the second birth and a negative effect on the third birth.

Milligan in 2005 investigated individual level fertility of Canada. Probit estimator was implemented. Dependent variable was a case if a birth of child happened or not. About 20 variables were included: education, family income, ethnicity, age and the macroeconomic environment. A rise in family income of $10 000 increases the probability of having a child by 1.75 percentage points.

Zhang, Quan and Meerbergen (1994), Del Boca (2002) found the effect of income on fertility insignificant. Zhang, Quan and Meerbergen (1994) used OLS estimator for Canada on aggregate time-series data on time span of 1921-1983.The dependent variable was the TFR. Independent variables included men's and women's wages and lots of other variables including contraceptive pill. Both men's and women's wages were found insignificant after regression.

Del Boca (2002) found family to be insignificant in two of his models on Italy. He used fixed effect logit estimator on individual level panel data between 1991 and 1995. The dependent variable was the occurrence of birth during last 2 years. The independent variables were: the proportion of children aged 1–3 in childcare for each of the Italian regions; the proportion of women in part-time work for each of the Italian regions; mother's age at first birth; household income; family transfers (from relatives); schooling; and whether grandparents were still alive.

Next set of literature was focused not only on effect of income in fertility but also on other factors influencing. Authors emphasized a wide specter of determinants of fertility such as: education level, bad habits like smoking and drinking, age at marriage of women, number of siblings' children of researched women.

Hashmi and Mok (2011) found the main reason of decreased fertility rate of Singapore. OLS estimator was used on a data from a unique household survey. Regression was run and the following main determinants were identified: age at marriage of a woman, household income and the quantity of brothers or sisters of a woman. Fertility is negatively related to age at marriage and positively related to number of siblings' children. However, connection between fertility and household income was U-shaped: the relationship is non-linearly negative up to income of S21,000 (in 2010 Singapore dollars) and positive for higher incomes.

Jain (1981) tried to dedicate his research to the importance of female education towards fertility rate. Eleven countries from Central America like Dominican Republic, Columbia etc. and Southeastern Asia like Fiji, Indonesia, and Thailand etc. were in research area. It is based on data published in First Country Reports of the World Fertility Surveys. Structure of the connection between fertility and education is shown to be similar across several developing countries. This analysis showed that increased female education can be expected to influence fertility behavior even without ceteris paribus. This logic can be understood that women see better education as increasing opportunity for participation in the paid labor force in the modem sector.

Schultz (1985) did analysis of relationship between income and fertility basing on Kenyan household survey data. Basically fertility is measured during only full family including both mother and father. Dependent variable is the consequence of having twins. Author found that it is more important to focus on income of household, however he mentioned about other two variables like parent education and household land.

Baschieri and Hinde (2007) used calendar data from the 2000 Egyptian Demographic and Health Survey (DHS) to evaluate the affecting factors for birth interval length among women. Using random effects estimator they found that such variables like social, economic and cultural background do not affect statistically significant. Basically birth intervals are

determined by the use of modern methods of contraception, breastfeeding and post-partum amenorrhea.

Kulu Kulu and Vikat (2007) identified one of the determinants of fertility as a housing type or form of dwelling. Using data from 1987 to 2000 of Finland Fertility Registrar, they studied the impact of housing type on first, second, and third birth distinguishing different housing types according to their sizes. Results dictated that the bigger the apartment, the more a chance of conception of first child. Also marital status was included in the list of independent variables.

Bauer, Chytilova and Streblov (2006) emphasized the importance of education level as one of the key determinants of fertility. Sample of 910 Ugandian respondents from the rural areas were in dataset. Findings stated that education stimulates a complex change in fertility preferences and also, that education is important as an efficient tool for reducing population growth. OLS estimator helped to get results.

Main factors influencing fertility from the covered literature includes: household income (Micevska and Zak, 2002, Naz, 2000, Grogan, 2006, Amialchuk et al, 2011), availability and type of housing (Kulu and Vikat, 2007), family ties (Bühler and Philipov, 2005).

Del Boca and Locatelli (2006) showed the joint determination of employment and fertility in his studies. The effect of employment on fertility varies between different studies on positive and negative effects. Probably, it depends on types of economies and institutional settings of particular country. Zabel (2006) and D'Addio and d'Ercole (2005) determined employment factor as positive variable coefficient and Hondroyiannis (2009) identified effect of employment with negative correlation on fertility.

Grossman and Joyce (1990) did unique analysis concerning already pregnant woman. The dependent variable was the decision of a pregnant woman to give birth or not by obtaining

abortion. Authors distinguished also by race and colors of women. They considered black and white women. Final results showed that black woman has a bigger shadow price of contraception relatively high and she is more likely to abort a pregnancy, while their opponents-counterparts (white) face a lower shadow price for contraception tending more to have a birth to child as it was more likely planned.

Otani (1996) analyzes the effects of wife's education and her participation in the labor market in terms of reproductively using the model of Cigno (1991) for Canadian and Japanese data. Actually, his estimation technique was the ordered logit model for the multivariate analysis of the number of children ever-born. Author detected that the wife's and spouse's level education, employment status and age at marriage influences this number negatively, and the marriage duration, religious views of woman, number of rooms in house have positive effects. Aggararwal, Netanyahu, Romano (2001) used probit and tobit (by cohorts) estimation of probability of birth in past 5 years taking into consideration independent variables like woman's age, education, predicted infant mortality and expenditure level of family.

Wong and Levine (1992) investigated really interesting effect. Their hypothesis was that the mood left after having taking care after child (usually first) effects the willingness to have more children. Authors estimated an effect of having additional caretaker (like babysitter) in the household on the fact of having more than one child in past 5 years, but finally the effect of having additional caretaker was insignificant.

Ahn (1995) focused on childbearing planning or, in other words, decision-making in terms of stochastic dynamic control problems. Results were taken on integer level. Researcher took into consideration a couple that decides on childbearing subsequently at each fertile period. That was implying that a couple does not know about the sex of unborn child. Estimation of the model investigated that the value of future children given to parents varies

according such a determinants: gender and age of current children, and the education level of females.

Empirical literature was done on macro and micro levels. Also researchers used worldwide country level data, household level and individual level datasets. Having analyzed all literature on topic of fertility, several important and useful conclusions about the determinants and overall results were made. The effect of income on fertility rate varies among different values because different set of countries were researched. Also results can be represented just in a simple dummy probability like in probit model for example, and also one can reach some concrete results using fixed effects and random effects. Also in some papers it was identified that connection between income and fertility is U-shaped: it might have positive relationship for one interval of income, and change for inverse relationship after having reached over this interval. Mostly the very often met variable was income or wage of female and male or wife and husband, sometime employment status was considered as well.

Looking through literature, a clear picture of all determinants of fertility was seen. Main determinants were excluded partially from different papers and finally collected in one set: age at marriage of female, female age, marital status of female, household income of female, using contraception methods, and female education. Also some variables were included by me: bad habits like drinking and smoking, the status of women within a household, location whether urban or rural, and ethnicity of women.

4 Theoretical background

4.1How do parents decide on childbearing?

Fertility choice was not much explained through economic prism before Gary Becker. The most traditional theory was born when Becker first introduced his paper on "An Economic Analysis of Fertility" in 1960. At those times the data for fertility outcomes weren't instantly providing economic grounding to analyze fertility. Many studies were facing puzzling correlations: some studies on industrialized countries have shown declining fertility along with rising income while many other studies faced situation when household income and fertility were correlated either positively and negatively. Lots of observers (demographers and sociologists) concluded that tastes for childbearing has weakened among high income families in contrast to low income families without any economic proof. Mostly economic theory of fertility was developing along with research done by Gary Becker in cooperation with different economists.

Since 1960 theory on fertility choices has developed in several stages:

-defining children as consumer durable goods

-introduction of quantity-quality concept

-identifying birth control knowledge as a possible determinant for fertility choices

-introduction of human capital concept as an additional tool for explaining fertility variance

What has made fertility analysis economical is an argument proposed by Becker that children can be considered as consumer durable goods. The main assumption made was that preferences for this kind of good are given and can influence decision to bear a child. This has left aside some of prior non-economic factors as religion, culture and et cetera (Easterlin, 1978). Children can bring a psychic income or satisfaction to parents. Also children can bring money income in future, thus they can not only be consumption goods but production goods as well (Becker, 1960).

The most crucial concept introduced by Becker was quantity-quality tradeoff in fertility decisions. When parents are deciding on childbearing they are considering not only quantity of children desired but also quality. According to this theory, child quality was defined as an amount spent on each child (health services, education, private utilities). Child quality concept gave an opportunity to explain relationship between fertility and income through standard consumer theory. Prior to discover of this concept income-fertility relationship was puzzling. Gary Becker argued that children are not inferior goods. He provided two arguments: there are not any close substitutes to children and conversely income-fertility relationship switches to positive after a certain level of income. Becker claimed that there is low income elasticity for child quantity and high income elasticity for child quality just as an example of family getting richer and acquiring new BMW instead of old Chevy and buying bigger house instead of getting more houses (Becker, 1960). So if family is investing more in a child quality (i.e. education), the cost of child quantity (having an additional child) is increasing. Becker and Tomes (1976) found out that income elasticity of child quality is higher at low incomes. This can help us to understand U-shaped relationship between income and fertility.

Researcher also conjectured that knowledge of birth control is a determining factor of fertility. The higher the income is the more is availability of birth control knowledge, thus lower is fertility. He proposed that lower-income families are less capable at birth controlling (Becker, 1960).

Later in cooperation with Kevin Murphy and Robert Tamura in 1990 Becker included one more explanatory variable into fertility model: human capital. Authors contrast human capital to physical capital in terms of rates of return: if one observes decreasing rate of return on investments in physical capital, in case of human capital rate of return on investments depends on initial stock of human capital. If initial human capital stock is relatively big then rate of return on investment is high relative to return on children. If initial human capital stock is relatively poor then rate of return on investments is low relative to return children. Thus countries with limited human capital stock choose to have bigger families and countries with rich human capital choose to have smaller families. That is why developing countries have relatively higher fertility rates compared to developed ones (Becker, Malthus and Tamura, 1990). See table 2 in Appendix.

However recently many researchers have casted doubt on perfectness of quantity-quality tradeoff theory as this might explain income-fertility correlation only. In order to check if quantity-quality are causal in respect to each other Qing (2009) has investigated effect of exogenous change in family size on education investments for children. Recently China has relaxed one child policy and this caused an exogenous shock to family size. This shock was used as an instrumental variable. Research has shown that second-born children actually increased school enrollment of first-born children. Also Montgomery, Kouame and Oliver (1995) did research on relationship between number of children and child schooling in Cote D'Ivoire and Ghana. They come up with conclusion that in rural areas of Cote D'Ivoire there is no trade-off: on average high child schooling goes along with high fertility. However in urban areas where females are more educated trade-off exists: lower fertility is associated with higher child schooling. Authors conclude that education is a key to family planning knowledge and thus in rural areas higher fertility is observed.

Economists also distinguish "opportunity effect" as treating by person any non-work activity like an opportunity cost of recently increased wage per hour wasted. Opportunity cost of any activity is the value measured in thing we might have done at well-paid hours. Thus the time spent on child is the opportunity cost of wage lost by not working outside the home. The higher the wage the higher is opportunity cost. Women's time should be really valued as a key determinant of fertility, no matter if she spent time in labor activity or not (Becker, 1981). A lot of other literature support theory about main determinants of fertility like age at marriage, marital status, ethnicity, employment and education.

4.2Hypothesis

The main economic determinant of fertility is income or wage of woman. Thus the main hypothesis will be about income of household: the more is the income, the less is fertility. Also, it would be good to testify hypotheses regarding level of education of female and place of residence divided on urban and rural: the more educated is a woman, the less children she tends to have; rural residents with worse living conditions tend to have more children.

5 Empirical framework

5.1 Data Description

The data used in the study is taken from Kyrgyz Integrated Household Survey (KIHS) that is conducted annually by Kyrgyz National Statistics Committee since 2003. KIHS is a survey on both household and individual level that covers 7 oblasts and one metropolitan area (Bishkek). Each year about 4779 households take a participation in the survey. Maximum a quarter of yearly sample is being replaced every year. KIHS contains different information about socio-economic, and demographics characteristics. Time span of data taken for research is period of eight years of 2005-2012.

The information includes such titles: Basic, Education, Health, Food Expenditure, Expenditure on Clothing and Shoes, Expenditure on Utilities, Dwelling Conditions, Savings, and others. Results obtained from the survey can be generalized to the entire population.

Data needed for research was taken on individual level and contains about 35000 with almost equally respondents distributed genders.

There might occur some biases because some respondents could give not fair answers. When checking for ethnicity of a particular people over time, answers are sometimes not consistent. Birth dates are also not the same for a particular person sometimes when checking it over time. In addition, households are not being surveyed over time if they change their location within Kyrgyzstan. If family moves to another region of Kyrgyzstan it is simply dropped. These facts casts doubt on panel representativeness of sample (Esenaliev, Kroeger and Steiner, 2011).

Information about Uzbeks and Russians could be insufficient sometimes because their shares in population are 9% and 16% correspondingly. Also some entries needed to be eliminated from dataset as they seemed to be recorded incorrectly: some females had 86

children. Information about ethnicity groups, gender and population distribution are in Table 3 and Table 4 (see Appendices).

5.2 Variable description

In order to get the most effective analysis, only women in fertile age were taken into consideration. Women younger than 15 and older than 49 were excluded from research data set. Most variables represent individual level information; however, some of them show household level data. The following is the list of explanatory variables (independent variables) retrieved from the household sample survey:

Total income of household (log_inc_year) – is a variable which presents the amount of total income in KGS earned by the members of household from different sources for a year. Natural logarithm of the actual value of household's total income will be taken for regression convenience.

Age (age) – is a variable that presents the age of a woman at date of interview.

Urban vs. Rural (urban_rural) – is a dummy variable, which is been used to describe whether the household resides in urban or rural region. It takes the value 1 if the household lives in urban region and 0 if the household lives in rural region.

Education (education) – is dummy variable, which tells about the level of education of a woman within the household. It takes value 1, if a woman studied after secondary school, and 0 if not.

Marital status (marital status) – is a dummy variable, which describes whether a woman is married, or not. It takes the value 1 – if a woman is married and 0 – if single. A woman is considered to be married in case of both official and unofficial marital statuses. A woman is considered to be single if she is unmarried, divorced or a widowed.

Alcohol (alcohol) – is a dummy variable that takes value 1 if the woman consumes alcohol, and 0 if not.

Smoke (smoke) – is a dummy variable, that takes value 1 if the woman smokes, and 0 if not.

Contraceptives (contraceptives) – is a dummy variable that takes value 1 if the woman uses contraceptive methods for pregnancy prevention, and 0 if not.

Ethnicity (Kyrgyz) – is a dummy variable, describing the ethnicity of a woman. It takes value of 1, if a woman responds to given nationality, and 0 if not. If a woman is Kyrgyz then variable takes value of 1, if non Kyrgyz then 0.

Square meters area (sq_met) – is total area of household's dwelling measured in square meters. This variable is used to capture the wealth effect on female fertility. Households with bigger houses tend to be wealthier and this factor might be an important characteristics for female having children.

The dependent variable is the following:

Fertility rate (fertility) – is a variable describing the current number of children of an interviewed woman.

Overall, there are 10 variables that can play important role as determinants of female fertility. All of these variables are included in econometric model and used for regression in order to make conclusion regarding hypotheses.

5.3 Model Specification

I filtered out the whole sample for women:

-who are in fertile age

-who have ever been married or had a sexual intercourse

-who are able to give a birth

Fertile age is between 15 and 49 years. Being able to give a birth was checked by having a question in a survey: "Have you ever experienced menstruation?"

$$\boldsymbol{Fertility}_{it} = \beta 0 + \beta 1 \boldsymbol{log\_inc\_year}_{\mathbf{it}} + \beta 2 \boldsymbol{age}_{\mathbf{it}} + \beta 3 \boldsymbol{urban\_rural}_{\mathbf{i}} + \beta 4 \boldsymbol{education}_{\mathbf{it}} + \beta 5 \boldsymbol{marital\_status}_{\mathbf{it}} + \beta 6 \boldsymbol{alcohol}_{\mathbf{it}} + \beta 7 \boldsymbol{smoke}_{\mathbf{it}} + \beta 8 \boldsymbol{contraceptives}_{\mathbf{it}} + \beta 9 \boldsymbol{kyrgyz}_{\mathbf{i}} + \beta 10 \boldsymbol{sq\_met}_{\mathbf{it}} + e_{\mathbf{it}}$$

5.4 Estimation procedure

When there is a panel data, several estimation techniques can be used according to different properties and characteristics of data. Methodology of this research is similar to methodologies used by Zhang, Quan and Meerbergen (1994) and many other authors. Three main estimation techniques have been used: Fixed Effects, Ordinary Least Squares and Linear probability model.

Having looked on the model, one can distinguish time varying and time-invariant variables according to special indicators like "it" and "i" respectively. Time-varying variables are, age of a woman at marriage and simply current age of a woman, marital status, smoking, drinking, contraceptives using, total household income, education of a woman. Ethnicity and area of living are the only variables defined as time-invariant.

Fixed effects estimation technique was chosen as baseline. When one performs panel data econometric estimation, he or she should decide on the right technique. Vast literature provides an evidence for using fixed effects in many cases, however random effects method is practiced as well. In order to identify if fixed effects is a better fit compared to random effects model I performed Hausman test and according to intuition of this test fixed effects model was a preferred one. Fixed effects technique is beneficial due its ability to control for individual time-invariant unobserved effects. In order to perform this estimation time-invariant variables like ethnicity and area of residence were excluded.

Additionally Ordinary Least Squares (OLS) and Linear Probability Model (LPM) techniques were performed. OLS regression allows including time-invariant characteristics like ethnicity and area of residence into model. It is very important to check for relationship between area of residence and fertility due to solid portion of literature on this topic. In addition, OLS let me check whether Kyrgyz nationality holders have more children or less when compared to non-Kyrgyz families.

LPM regression was done to check for association between different individual or household characteristics and probability of having children by a female. In my analysis I assume that family decision to have children is made differently depending on order of a child. Once married young couple will have to decide on a childbearing. I suppose that the decision to have first child is less rational compared to decision to have second or third child for example. In majority of cases due to specificity of kyrgyz traditions first children are usually born regardless of an income, education or area of residence. There is some space for non-economic grounding of having first child for a family.

Three different LPM regressions were done: the first LPM has a dependent variable as a probability of having any children (more than 0), the second LPM has a dependent variable as a probability of having only one child (first child) and the third LPM has a dependent variable as a probability of having children after the first child was born (more than 1).

It is important to note that no instrumental variable or randomized control trial method was used in current analysis. Given all data imperfections and econometric limits, the results of regression will present an association or correlation between variables of interest and dependent variable. As there is no guarantee that regression results will provide causal relationship, it is very important to mind it when suggesting policy implications.

5.5 Interpretation of the estimated results

As the objective of the paper was to reveal the correlation between fertility and its main determinants, I ran two additional regressions (pooled OLS, Linear Probability Model) besides Fixed Effects. Table 1 below depicts the results of these regressions. We can see that, in general, the direction of coefficients of OLS and FE coincide, except of three ones (Education, Alcohol, and Sqmet). The F-test after Fixed Effects suggests that the time invariant individual effects exists and correlate with regressors. Therefore, FE estimation is a baseline.

Table 1

VARIABLES	OLS(i) fertility	FE(ii) fertility	LPM(iii) fertility
log_inc_god	-0.0831***	-0.0397***	-0.00761***
	(0.00926)	(0.00423)	(0.00143)
age	0.126***	0.158***	0.0347***
	(0.00764)	(0.00440)	(0.00155)
education	0.0619	-0.0724***	0.0118
	(0.0573)	(0.0210)	(0.00782)
marital status	1.387***	0.600***	0.726***
	(0.0273)	(0.0218)	(0.00908)
alcohol	-0.0398*	0.0203**	0.0195***
	(0.0221)	(0.00890)	(0.00318)
smoke	-0.279***	-0.0328	-0.0316**
	(0.0613)	(0.0269)	(0.0134)
contraceptives	0.704***	0.0512***	0.0595***
	(0.0202)	(0.00838)	(0.00447)
sqmet	0.00361***	-3.48e-05	-1.71e-05
	(0.000653)	(0.000155)	(4.08e-05)
urban_rural	-0.400***		-0.00159
	(0.0220)		(0.00288)
kyrgyz	0.271***		-0.00102
	(0.0171)		(0.00322)
Constant	-2.251***	-1.708***	-0.465***
	(0.163)	(0.0800)	(0.0273)
Observations	23,659	37,871	23,659
R-squared	0.598	0.290	0.815

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Column (ii) of table 1 above shows the results for FE estimation. The correlation between household's income and a women's fertility is negative, meaning that more wealthy individuals tend to have fewer children than less wealthy ones. Though the coefficient on log_inc_year is economically insignificant (one percent increase in income is associated with $\frac{0.0397}{100}$=0.000397 percent reduction in dependent variable, fertility) - it is statistically significant at 1% significance level.

The correlation of fertility with a women's age is positive, as a common sense predicts. Older women tend to have more children than younger ones. The coefficient is significant both statistically and economically: 6 years increase in woman's age is approximately associated with one more child.

Education appears to be negatively correlated with fertility. This means that women who obtained education above secondary, on average, have fewer children. This result is consistent with the idea that more educated parents tend to have fewer children than less educated ones.

The Marriage, with no surprise, is an important factor in determining a woman's fertility. Married women tend to have more children. The coefficient is statistically significant.

The alcohol consumption appears to be positively correlated with fertility. However, that does not mean that alcohol consumption have positive effect on the number of children a woman has. This may happen simply because alcohol consumption is negatively correlated with household's income. Wealthy individuals tend to care more about their health. And we also know from above, that income is negatively correlated with the fertility.

The smoking habits are negatively correlated with fertility, though the coefficient is not statistically significant.

Surprisingly, the usage of pregnancy prevention tools (PPT) is positively correlated with the fertility, again meaning no causation link. This result may be affected by poor representation of those who do not use PPT in the data. Particularly, 75% of all surveyed women use PPT.

The wealth effect, captured by square meters of dwelling, is not statistically significantly correlated with the fertility.

68% of women, represented in the data, have one or more children. Thus, it makes sense to run Linear Probability Model on a binary depended variable (have/does not have children). The results are provided in the column (iii) of Table 1. The results of LPM to much extent coincide with the ones of FE estimation, except for the coefficient on education.

Since the family behavioral patterns may change after the birth of the first child, it makes sense to run LPM on those who have exactly one child (first child), and those who have more than one child. The results of these regression are provided in the table 5 (Appendices). Colum (i) depicts the first regression results, column (ii) – the results of the second regression. We can see, that coefficients, indeed, differ in two regressions. Particularly, the income is positively correlated with probability of having exactly one child; and is negatively correlated with probability of having more than one child. This result is consistent with the theoretical background: wealthy households tend to have not more that one-two children. The second important thing to notice is the difference in correlation with urban/rural factor. The results suggest the urban households are likely to have fewer children: the coefficient on urban dummy is positive in case of only one child, and negative in case of more than one child. The third thing worth to note is the difference in coefficients on pregnancy prevention tools. The coefficient is negative in case of only one child: meaning that usage of PPT decreases probability of having the first child. In case of more than one child the coefficient is positive.

Column (i) of Table 1 shows the results for OLS estimation. One important coefficient to focus on is coefficient for area of residence. The result suggests that urban residents have less children rather than rural residents. This association is statistically significant. Sign of correlation is not surprising and matches with theory provided in literature. Logic behind this correlation might be following: rural residents have lower access to education and less income level on average, thus they have more children.

6. Conclusion, input of the paper and policy-making suggestions

Fertility is a very important economic factor which can explain or influence human capital. In order for country to develop it needs to have optimal population along with well-educated and productive labor force. Some countries experience a problem of shortage of population, and others experience overpopulation. t is very important to have an optimal size of a population for stable growth. If the number is not optimal, policy-makers might introduce some regulations to increase or decrease the size of population. The main purpose of this paper was to identify individual female characteristics that might influence fertility behavior among women in age from 15 to 49. My hypotheses were the following: Higher income leads to lower fertility; Better education decreases number of children to be born, rural residents have more children than urban.

Previously there were several research done on fertility related topic in Kyrgyzstan by Nedoluzhko and Andersson (2007) and Meyer (2011), however neither of them conducted panel data analysis on fertility behavior determinants. I couldn't find any literature on fertility in Kyrgyzstan using Kyrgyz Integrated Household Survey data which is being the largest and longest dataset with panel structure so far. My study helped to understand individual female characteristics which might influence fertility behavior in country. All initial hypotheses based on theoretical background have been justified by fixed effects regression results. Regression output shed light on correlation between female household fertility and such factors as income, education and area of residence. It is crucial to investigate fertility patterns further preferably using more advanced econometrical methodologies in order to get closer to causal explanations. Research conducted by me has made the ground for future analyses wider and clearer.

Fertility rate in Kyrgyzstan is currently about 3.2 children per woman and this can be considered as replacement fertility. Replacement fertility is a required number of children per family which will ensure sustainable population level. In most industrialized countries on average replacement fertility is considered to be 2,1 children per family (father and mother only) while in developing countries it ranges from 2,5 to 3,3 due to higher mortality.

This paper identified the association between fertility and individual female characteristics in Kyrgyzstan. It is clear that in urban areas families decide on number of children based on quantity-quality principle while in rural areas children are more treated as production goods. Urban residents have higher levels and tend to have less quantity of children by trying to increase their quality while rural residents are poorer on average and tend to have more children as they want their children to bring income in future. Most probably the key determinant for family planning decision is education as it is better in urban areas and poorer in rural zones. Probably the most powerful policy that could influence fertility behavior in Kyrgyzstan is education. Compared to urban areas, families in rural areas are poorer and they require their children to enter workforce earlier. High fertility in rural areas is a signal for the low level of education. It would be much better if we could have the same fertility behavior but with stronger education. Those children with better quality education would be more productive and the economy in general would improve.

References

1. Aggararwal R., Netanyahu S., Romano C. (2001) Access to natural Resources and the Fertility Decision of Women: the Cases of South Africa, Environment and Development Economics 6, 209–236.
2. Ahn N. (1995). "Measuring the Value of Children by Sex and Age Using a Dynamic Programming Model."*Review of Economic Studies* No 62, 361–379.
3. Amialchuk, Aliaksandr, Lisenkova, Katerina, Salnykov, Mykhaylo and Maksim Yemelyanau (2011). "Economic Determinants Of Fertility In Belarus: A Micro-Data Analysis" *BEROC WP*. May 2011.
4. Barro, R., & Becker, G. (1989). Fertility Choice in a Model of Economic Growth. *Econometrica, 57*(2), 481-501
5. Bauer, m., Chytilova, j., & Streblov, P. (2006). Effects of Education on Determinants of High Desired Fertility: Evidence from Ugandan Villages. *Institute of Economic Studies, Faculty of Social Sciences.*
6. Bashieri, A., & Hinde, (2007). "Effects of modernization on desired fertility in Egypt. *Population, Space and Place. 13(5):*353-376
7. Becker Gary (1960). "Demographic and Economic Change in Developed Countries." *Princeton: National Bureau of Economic Research*, 209-231
8. Becker Gary (1981). "A Treatise on the Family." *Cambridge, Mass.: Harvard University Press*
9. Becker, G. S. (1992). "Fertility and the Economy." *Journal of Population Economics* 5(3): 185-201.
10. Becker, G., & Lewis, H. (1973). On the Interaction between the Quantity and Quality of Children. *Journal of Political Economy*, *81*(2), S279-S288
11. Becker, G., and Tomes, N. (1976). "Child Endowments and the Quantity and Quality of Children." *Journal of Political Economy 84* (4), S143–S162.

12. Becker, G., Murphy, K., & Tamura, R. (1990). Human Capital, Fertility, and Economic Growth. *Journal of Political Economy,98*(5), S12-S37
13. Becker, Gary S. and Nigel Tomes. (1976). "Child Endowments and the Quantity and Quality of Children." *Journal of Political Economy* 84 S143-S162.
14. Becker, Gary, and Gregg Lewis. "Interaction Between Quantity and Quality of Children." *In TheEconomics of the Family* 1974. United Nations. "World Population Prospects: The 2002 Revision." *New York: United Nations*, 2003.
15. Boca, D. (2002). "Do child care costs affect labor supply?" *Centre for Household, Income, Labour and Demographte Economics*
16. Bühler, Christoph and Dimiter Philipov (2005). "Social capital related to fertility: theoretical foundations and empirical evidence from Bulgaria." *Max Plank Institute for Demographic Research, WP 2005-016* June 2005.
17. Butz WP, Ward MP (1979). "The Emergence of Countercyclical U.S. Fertility." *American Economic review (3)*:318-28
18. Cigno A. (1991). "Economics of the family." *Oxford: Clarendon Press*.
19. d'Addio, A. C. and M. M. d'Ercole. 2005. "Trends and Determinants of Fertility Rates: The Role of Policies." *OECD Social, Employment and Migration Working Paper* No. 27.
20. Denisenko, M. (2004). "Fertility in Kyrgyzstan." *National Statistical Committee of the Kyrgyz Republic (in Russian)*, pp. 206−241. of Policies." *OECD Social* Web.
21. Easterlin Richard (1978). "What Will 1984 Be Like? Socioeconomic Implications of Recent Twists in Age Structure." *Demography 15* (4), 397–432.
22. Ehrlich, I., Kim, J. (2007). "Has Social Security Influenced Family Formation and Fertility in OECD Countries?" *Journal of Pharmaceuticals Policy and Law* 99-120.
23. Esenaliev, D., Kroegee, A., & Steiner, S. (2011). "The Kyrgyz Integrated Household Survey." *Deutsches Institut für Wirtschaftsforschung*

24. Ghazala, Naz (2000). “Determinants of Fertility in Norway.” *Centre for Economic Studies in Social Insurance* 2000.
25. Grogan, Louise (2006). “An Economic Examination of the Post-Transition Fertility Decline in Russia. Post-Communist Economies” vol. 18, issue 4, pp. 363-397, September 2006.
26. Grossman M., Joyce T.J. (1990). “Unobservables, Pregnancy Resolutions, and Birth Weight Production Functions in New York City.” *Journal of Political Economy* 98 (5).
27. Hashmi, Aamir Rafique and Mok, Wen Jie, (2011). “The Determinants of Low Fertility in Singapore: Evidence From a Household Survey.” *Singapore Economic Review*,*58(4)*1-26
28. Heckman J., Walker, JR., (1990). “The Relationship Between Wages and Income and the Timing and Spacing of Births: Evidence from Swedish Longitudinal Data.” *Econometrica 58*:1411-1441
29. Hyatt, D., & Milne, W. (1991). Can Public Policy Affect Fertility? *Canadian Public Policy / Analyse De Politiques, 17*(1), 77-85
30. Jain, A. 1981. “The Effect of Female Education on Fertility: A Simple Explanation.” *Demography* 18(4): 577-595.
31. Kulu, Hill and Andres Vikat (2007). “Fertility differences by housing type: an effect of housing conditions or of selective moves?” *MPIDR* March 2007.
32. McNown, R. and C. Ridao-Cano. 2004. "The Effect of Child Benefit Policies on Fertility and Female Labor Force Participation in Canada." *Review of Economics of the Household 2*:237-54.
33. Meyer, Kristin (2011). “Fertility Change in Central Asia: How Marriage Timing & Contraceptive Use Are Evolving in Post-Soviet Kyrgyzstan.” *University of Michigan*
34. Micevska, Maja B. And Paul J. Zak (2002). “What Accounts for the Emergence of Malthusian Fertility in Transition Economies?” *Claremont Colleges* February 2002.

35. Milligan, K. (2005). Subsidizing the Stork: New Evidence on Tax Incentives and Fertility. *The Review of Economics and Statistics, 87*(3), 539-555.

36. Montgomery, M., Oliver,R., and Kouame, A. (1995). "The Tradeoff Between Number of Children and Child Schooling: Evidence from Côte D'Ivoire and Ghana." *World Bank Publications*

37. Nedoluzhko, L., Andersson, G. (2007). "Migration and first-time parenthood: Evidence from Kyrgyzstan." *Demographic Research 17(25)* 741-774

38. Otani, K. (1996). "The Cigno Model and Cumulative Fertility in Canada and Japan: the Effects of Wife's Education and Work Experience." *Kansai University Review of Economics and Business* 24 (1–2), 1–26.

39. Qian Nancy (2009). "Quantity-Quality and the One Child Policy: The Only-Child Disadvantage in School Enrollment in Rural China." *NBER*

40. Risse, L. (2006). "The effect of the baby bonus on Australian women's childbearing intentions." *Journal of Population Research* 213-240

41. Ronsen, Marit (2004). Fertility and Public Policies – Evidence from Norway and Finland. Demographic Research, Vol. 10, art. 6, pp. 143-170, 07 May 2004, <www.demographic-research.org/Volumes/Vol10/6/>

42. Rosenzweig, Mark, and Kenneth Wolpin. "Testing the Quality-Quantify Fertility Model. "*Econometrica* 48 (1) (1980): 227-240.

43. Schultz, T. P. 1985. "Changing World Prices, Women's Wages, and the Fertility Transition: Sweden, 1860-1910." *Journal of Political Economy* 93(6): 1126-1154.

44. Tasiran AC (1996). "Wage and income effects on the timing and spacing of births in Sweden and the United States". *Doctoral dissertation. Department of Economics, Gothenburg University.*

45. Walker JR (1995). "The effect of public policies on recent Swedish fertility behavior".*Journal of Population Economics* 8: 223-251.

46. Wong R., Levine R.E. (1992). "The effect of Household Structure on Women's Economic Activity and Fertility: Evidence from Recent Mothers in Urban Mexico." *Economic Development and Cultural Change.*

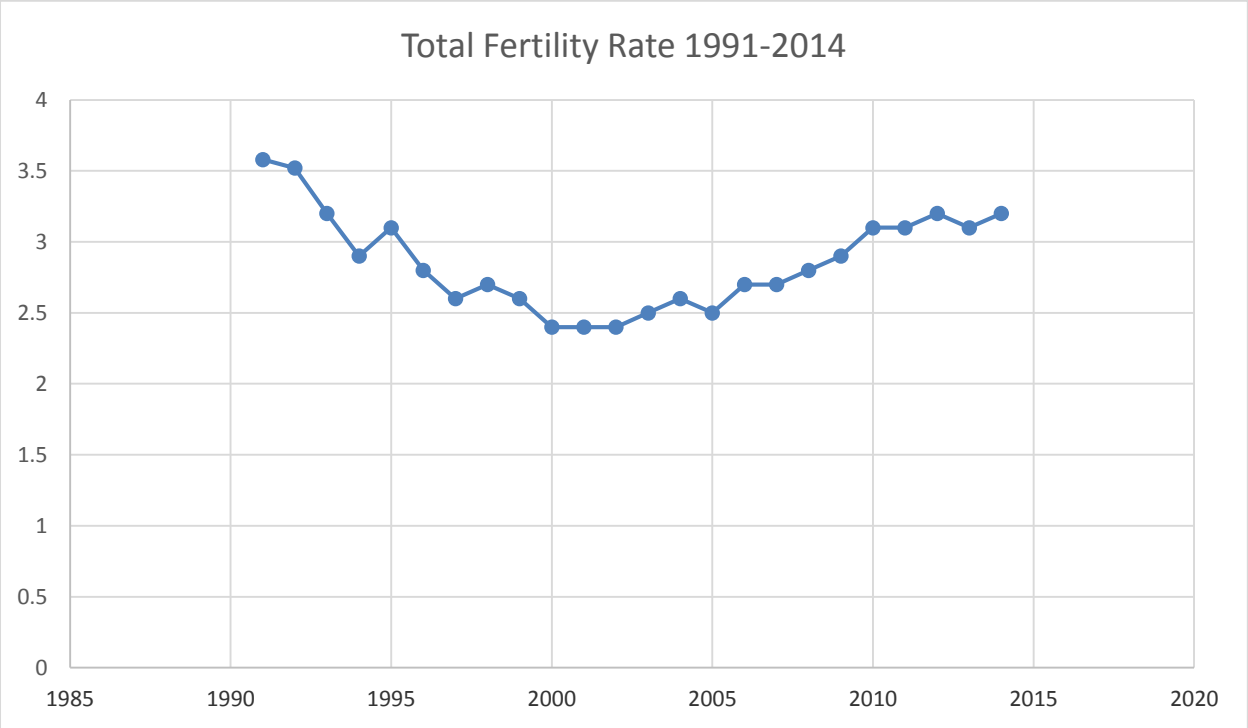
47. Zabel, Cordula (2006). "Employment Experience and First Birth in Great Britain." *MPIDR WP* 2006-029, August 2006.

48. Zhang, J., Quan, J., & Van Meerbergen, P. (1994). The Effect of Tax-Transfer Policies on Fertility in Canada, 1921-88. *The Journal of Human Resources, 29*(1), 181-201

Appendices

Graph 1

Kyrgyzstan fertility rate by years: World Bank



Graph 2

Kyrgyzstan fertility rate by years: World Bank

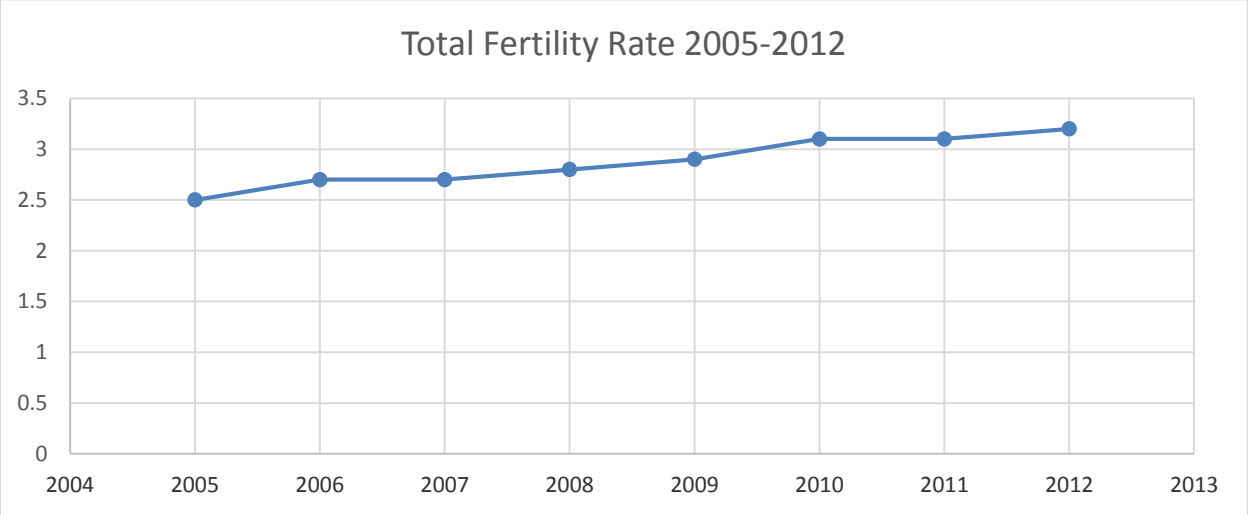


Table 2

Source: United Nations, 1991, World Population Prospects 1990, medium variant

Period measures of fertility, infant mortality and life expectation at birth for world's regions[a]

	1950	1960	1970	1980	1990	2000
1. World						
Total fertility rate	5.00	4.98	4.46	3.65	3.31	2.96
Infant mortality rate	155	118	93	79	63	51
Life expectation	47.5	53.2	58.6	60.4	63.9	67.0
2. Higher income						
Total fertility rate	2.84	2.69	2.20	1.93	1.88	1.91
Infant mortality rate	56	32	22	16	12	9
Life expectation	66.0	69.8	71.1	72.8	74.9	76.6
3. Lower income						
Total fertility rate	6.19	6.09	5.41	4.19	3.71	3.20
Infant mortality rate	180	136	105	89	70	57
Life expectation	42.2	48.5	55.2	59.4	63.3	66.5
4. Latin America						
Total fertility rate	5.87	5.96	4.99	3.93	3.25	2.81
Infant mortality rate	126	100	81	61	48	37
Life expectation	51.9	57.3	61.3	65.2	68.1	70.4
5. South East and East Asia						
Total fertility rate	5.78	5.47	4.59	2.77	2.47	2.13
Infant mortality rate	175	114	72	46	34	24
Life expectation	44.1	51.5	61.6	66.3	69.7	72.1
6. South and West Asia						
Total fertility rate	6.17	6.07	5.78	5.16	4.47	3.61
Infant mortality rate	190	157	134	111	88	68
Life expectation	39.6	45.4	50.2	55.1	59.9	64.4
7. Africa						
Total fertility rate	6.65	6.79	6.62	6.40	6.03	5.31
Infant mortality rate	188	165	137	116	94	77
Life expectation	37.7	41.8	45.9	49.6	54.1	58.1

Table 3

KIHS gender distribution

h_gender	Freq.	Percent	Cum.
Male	9,221	64.03	64.03
Female	5,180	35.97	100.00
Total	14,401	100.00	

Table 4

KIHS respondents' distribution by ethnicity groups

Ethnicity	Freq.	Percent	Cum.
Kyrgyz	8,362	67.11	67.11
Russian	2,006	16.10	83.20
Uzbek	1,148	9.21	92.42
Dungan	76	0.61	93.03
Uigur	70	0.56	93.59
Kazakh	100	0.80	94.39
Tatar	212	1.70	96.09
Tajik	76	0.61	96.70
Ukranian	175	1.40	98.11
Turk	34	0.27	98.38
German	59	0.47	98.85
Korean	53	0.43	99.28
Other	90	0.72	100.00
Total	12,461	100.00	

Graph 3. Source: World bank

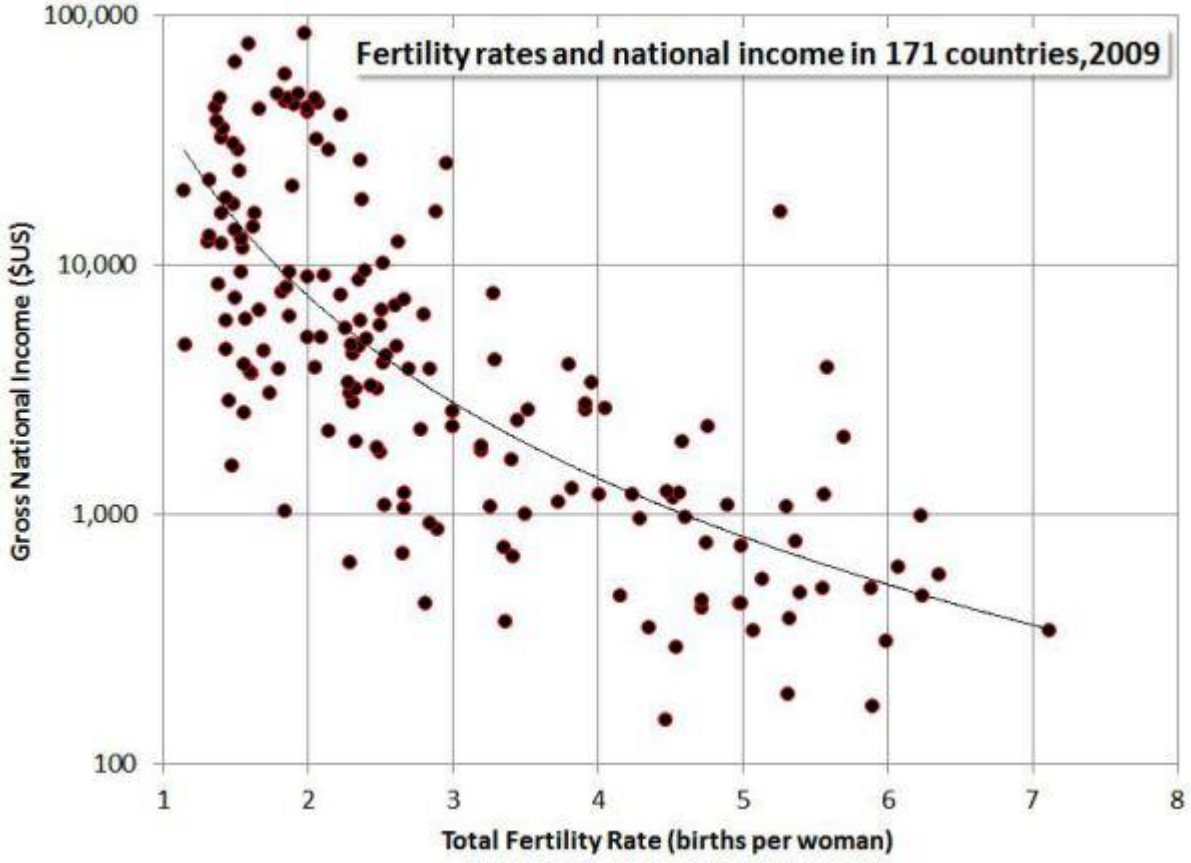


Table 5

VARIABLES	LPM(i) firstchildprob	LPM(ii) afterfirstchild
log_inc_year	0.00357*	-0.0112***
	(0.00207)	(0.00213)
age	-0.0157***	0.0505***
	(0.00175)	(0.00177)
urban_rural	0.0407***	-0.0423***
	(0.00451)	(0.00456)
education	0.0201	-0.00833
	(0.0150)	(0.0146)
marital status	0.298***	0.427***
	(0.0101)	(0.00945)
alcohol	0.0216***	-0.00207
	(0.00561)	(0.00572)
smoke	0.0683***	-0.0999***
	(0.0195)	(0.0198)
contraceptives	-0.138***	0.197***
	(0.00629)	(0.00626)
kyrgyz	-0.0375***	0.0365***
	(0.00483)	(0.00491)
sqmet	-0.000186*	0.000169*
	(9.62e-05)	(8.67e-05)
Constant	0.393***	-0.857***
	(0.0355)	(0.0363)
Observations	23,659	23,659
R-squared	0.146	0.613

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Glossary:

Total Fertility Rate (TFR) - number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year.

Replacement fertility - the total fertility rate at which women would have only enough children to replace themselves and their partner

Age-specific fertility rate - the number of births occurring during a given year or reference period per 1,000 women of reproductive age classified in single-or five-year age groups

Infant mortality - the death of a child less than one year of age

Ceteris paribus - other things equal

Probit estimator - a type of regression where the dependent variable can only take two values

Breastfeeding - the feeding of an infant or young child with breast milk directly from female human breasts

Post-partum amenorrhea – is the absence of menstruation after giving a birth

Cohort - a group of subjects who have shared a particular event together during a particular time span

Pronatalist view- encouraging an increased birthrate view

Unwed – unmarried condition of something, for example, child birth

KIHS – Kyrgyz Integrated Household Survey