DOCTOR OF ECONOMICS AND BUSINESS MANAGEMENT

Child marriage, fertility and economic development

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Award date:
2018

Awarding institution:
University of Namur

UNIVERSITÉ DE NAMUR

UCL Université catholique de Louvain

CHILD MARRIAGE, FERTITLITY AND ECONOMIC DEVELOPMENT

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Academic year 2017-18

Project presented as part of the requirements for the award of the Advanced Master in International and Development Economics

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Abstract. This paper investigates the link between fertility and the timing of marriage, specifically the risk for girls to fall into child marriage. The analysis is made using data from the fourth 2010 DHS (Demographic and Health Survey) implemented in Burkina Faso. Surprisingly, we first find that child marriage is on a rise over time when focusing on women age cohort. This is at variance with the global child marriage trend in the country. Second, we find that women fertility captured by the total number of children ever born increases as the age at first marriage decreases. Thus, a delay of marriage timing significantly reduces the fertility potential of women. Finally, we show that higher parental fertility proxied by woman's number of siblings is associated with lower age at first marriage and higher risk of child marriage. Therefore, girls from extended families are more likely to be exposed to early marriage. The pressure exerted on household resources in extended families could explain why distressed parents are inclined to marry early their daughters. Policies aimed at empowering girls through better education associated with a raise of religious leaders' awareness about child marriage drawbacks are welcome to tackle early marriage phenomenon.

I would like to thank my Supervisor Professor Fabio Mariani for introducing me to the interesting subject of child marriage and providing helpful and rigorous comments throughout the process of this research. I would also like to thank my Tutor Jeremie Gross for strong commitment, constructive discussions and advices.

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1. Introduction

Child marriage is a barrier to individual, social and economic development. Defined as a formal or informal union before the age of 18 (UNICEF 2014), child marriage is rooted in gender inequalities, has substantial negative development impact on women and their offspring. Early marriage also limits female schooling opportunities. Most girls who marry early are dropped out of school to devote their time to marital duties. Field and Ambrus (2008) and Nguyen and Wodon (2015a) suggest that each year of early marriage below the age of 18 can lead to a decrease of 4 to 6 percentage points in the probability of secondary school completion for girls. Early motherhood has also been linked to low human capital development through health channel. Physically, early child bearing may lead to life-threatening for both mother and child. Women age under 20 face higher risk of dying in childbirth from 2 and 5 times higher than women above 20 (WHO, 2008). It has been associated with various psychological and health risks (UNICEF 2001), including vesico-vaginal fistulae (Akpan 2003) and a higher likelihood of acquiring HIV/AIDS. This is because early marriage often eliminates a girl's ability to abstain from sex and thus increases the frequency of intercourse while also decreasing condom use (Clark 2004). Child marriage may influence women's labor-force participation. More likely to be pulled out of school, early marriage leads girls to lower participation in the formal labor market and lower earnings over time. Secondary and post-secondary education are strongly associated with labor force participation (Cameron, Dowling, & Worswick 2001; Mammen & Paxson 2000), but most girls who marry early do not reach that level. As a consequence, child marriage clearly contributes to poverty (Otoo-Oyortey and Pobi 2003).

Child marriage rate has seen recent decline, but its progress has been slight and remains unevenly spread across countries. According to estimates from UNICEF (2014), more than 700 million women married before 18 years old and 25 million entered into union before 15 in the world. The magnitude of early marriage varies between countries and regions. The highest rates are reported in South Asia and Sub-Sahara Africa where 56% and 42% of women aged 20 to 49 respectively got married before 18 .Furthermore, Nguyen and Wodon (2012, 2014a) basing on data from 60 low and middle income countries, suggest that about 40% of girls in those countries still marry before the age of 18. They particularly found that 45.4% of girls born between 1985 and 1989 married early in sub-Saharan Africa.

Burkina Faso does not make any exception in this regard. The 2003 and 2010 DHS conducted in Burkina reveals that a large share of women enters into marriage at early age. In 2003, 51.9% of women aged 20 to 24 got married before 18. This proportion has been decreased at very slow rate (0.3%) and was established in 2010 at 51.6% for women of the same age group. Child marriage rates are higher among women than among men for all age categories. Thus, men are getting married at a later age than women since they are expected to marry after becoming breadwinners or having completed a certain level of education. The mean age at first marriage is 17.8 for women, whereas it is estimated at 25.5 for men. Among men of the same age group of women aged 20 to 24, only 4.7% entered into their first union before 18 in 2003. The progress of decline in early marriage has been faster for men than women since the proportion of child marriage for men of 20 to 24 decreased from 4.7% in 2003 to 3.9% in 2010. The incidence of female child marriage varies from one region to another. This rate is about 86% in the northern side of country (Sahel region) while it is 76% in the eastern part (UNICEF 2016). The relative insignificant share of male child marriage in the country leads us to emphasize on female child marriage in this paper.

Classified among countries with the highest level of child marriage, Burkina Faso has also one of the highest fertility rates worldwide. The fertility rate declined over time but still remains at a very high level. The number of children per woman was estimated at 6.9 in 1993 and 6 in 2010. Indeed, women married earlier are more likely to be pregnant at early age, experience early motherhood, and have more children over their life time. This is typically observed among traditional populations in Asia and Africa where age at first marriage is younger and fertility level higher (Coale 1971; Bongaarts 1983; Week 2007). Thus, early marriages have a higher risk to result in large-sized families and to increase the population size at macro level. Do women marrying early have a higher fertility lifetime? Is there a link between parental fertility and the marriage timing of their children? Does parental fertility affect the risk of early marriage?

Regarding the high prevalence and the slow decline of child marriage rate associated with the growing population of girls, recent estimates from UNICEF (2017) show that without intensive effort to reduce levels of the practice in West and Central Africa, the number of child brides will be growing increasingly as the population is growing. A doubling of the rate of decline would even not be sufficient to decrease the number of girls marrying each year. Based on this alarming fact, the international community has called for urgently acting to end the harmful practice of child marriage. Ending child marriage by 2030 is now a target under

the Sustainable Development Goals (SDGs). Relatively few countries have adopted comprehensive strategies to end this practice. In this way, the United Kingdom government and UNICEF jointly hosted in July 2014 the first ever Girl Summit to mobilize efforts to end child, early, and forced marriage as well as female genital mutilation. The World Bank, UNFPA, UNICEF, governments and foundations provide with support in implementing interventions to empower women and educate girls to reduce child marriage in many countries. In Burkina Faso the authorities adopted a national strategy to end child marriage by 2025. The plan defines a child as someone under the age of 18, and considers "marriage" to include all forms of union between a man and woman, whether celebrated by a public officer (formal marriage) or a traditional or religious leader (informal marriage). However, serious concerns remained about the legal framework and weaknesses in the enforcement of the law. Under the law, early and forced marriage is banned, but in an inadequate and discriminatory manner. The age limit for marriage is 21 for males but 17 for females. The law only applies to formal marriages registered by the state. This type of union corresponds to a small fraction of marriages taking place in the country. The law therefore does not deserve any specific attention to traditional and religious marriages.

Ending child marriage requires a deep understanding of its complex drivers behind the practice in different contexts in order to help designing and adapting accordingly effective policies. If many Economists have been interested in the effect of child marriage on several economic outcomes, few have examined the important question of why such a practice is still so widespread in many developing countries. This study is an attempt to analyze the relationship between early female marriage and women fertility in Burkina Faso, where early marriage is still predominant and fertility rate high.

The remainder of the paper proceeds as followed. Section 2 investigates the causes of child marriage practice. Section 3 presents a review of literature. Section 4 describes the data used in the analysis and provides some descriptive statistics. Section 5 explains the empirical identification. Section 6 presents and discusses the results and section 7 concludes.

2. Rationales

Multiple factors contribute to the perpetuation of child marriage. Among those are socioeconomic factors such as poverty, lack of educational and employment opportunities for girls, and cultural factors as well as social norms and religious beliefs. The underlying causes of early marriage may be viewed at both sides of supply from household willing to marry

their daughter at younger ages and demand side linked to the desire of men looking for young girls.

On the supply side, poverty of households may justify early marriage. The pathways through which poverty may increase the likelihood of marrying early are several. First, Financial transactions around marriage contribute to the practice. In most West African countries where the groom provides bride price in the form of assets to bride's family at the time of marriage, parent may have incentives to marry earlier their daughters. Bride price may be interpreted as the purchase of the rights to a woman's labor and reproductive ability and is prevalent in many parts of the world, including most Sub-Saharan Africa countries and in some regions of Asia (Anderson, 2007a). Young girls are hence a valuable asset for their family since they can be exchanged through marriage for a bride price. In the case that the bride family has to provide assets denoted dowry to the groom family at the time of marriage, households can be encouraged to push into marriage young girls, considering that dowry is more costly when the bride is older and more educated. The short term economic benefits of the parents to marry their daughter earlier are opposed to the long term return of the latter. Second, another argument that may explain parent's decision for early marriage relies on children security. In areas where girls are at high risk of harassment, violence and physical or sexual assault, including places in conflict and without law rules, parents would feel better to give their daughter in marriage at younger age for their safety. Third, inaccessibility to adequate primary and secondary education could also drive parents not to delay marriage. It could be that parents are well informed on the future gain provided by education. However, they may face a set of constraints among which are schooling cost including opportunity cost combined with the poor quality of education that do not allow them to send their daughter to school. In the absence of alternative, families and sometimes girls themselves believe that marriage remains the better choice (Perlman et al. 2017b). Fourth, national economic conditions or crises, or individual economic shocks, such as a bad harvest or the illness or death of a primary income earner, may also cause households to marry their daughters early. The economic pressures for early marriage may be strengthened where grandparents or other relatives are left to care for orphan children. With this regard, it may even be seen as in the interest of the child to be married earlier. Fifth, higher fertility within the household can explain how costly could be to raise a large number of children (food, clothing, education, health care). In such cases, girls viewed as an economic burden by their parents are more likely to be married early. In addition, the dominance of gender inequality in some societies tends to value more boys than

girls. In such a case, girls are not prioritized in household resource allocation especially through education investment decisions.

On the demand side, from the perspective of the groom, younger brides may be preferred for a number of reasons. First, grooms tend to express a preference for younger brides because they are more likely to have longer reproductive life time. Thus, a stronger demand for younger brides may be expressed in regions where desired fertility and infant mortality rates are high. Second, young girl's sexual attractiveness is a major determinant of the demand of young brides. According to Field and Ambrus (2008) child bride is preferred because she is more desirable, easier to control, less assertive due to her lack of physical, mental and emotional maturity. Third, young girls may also be able physically to better perform household activities. For instance, families with an important endowment of agricultural land in rural areas are more likely to prefer younger brides for their labor force. Fourth, the likelihood of younger brides to have had less previous sexual contact resulting in lower risk of sexually transmitted diseases may be considered important or essential to the groom and his family.

Polygamy may explain in many societies, namely in Africa, why child marriage is preponderant. In most polygamous families, the additional wife whom the household takes on tends to be young. Among other reasons motivating polygamous men, are the attractiveness and the high fertility potential of young girls. In addition, the economics and sociology literature suggest that individuals bond more easily within their own age, ethnic, and religious groups. A shortage of partners within same age group on the marriage market in most polygamous societies may leave men with the only option to marry younger women. Some studies carried out on African countries reveal that female child marriage tend to be higher in polygamous as compared to monogamous unions. For instance, In Burkina Faso, 67.98% of women aged 18 to 22 are married early in monogamous union while it is 72.86% of them in polygamous unions (Onagoruwa and Wodon 2017h).

Other motives embedded in cultural norms and religious traditions ease the practice of child marriage. In most traditional societies, a particular attention is given to bridal purity that tends to promote early marriage. Child marriage is accepted as a means of preventing the premarital loss of virginity, both voluntary and involuntary. For instance in Islam, a high value is placed on a girl's virginity. It is a shame for parents to know that their daughter is not virgin when she marries. Consequently, for the sense of honor and morality an adolescent girl may be married earlier regardless of maturity age.

3. Previous Studies

Some studies in the literature addressed early female marriage or early child birth as influencing well-being (Field and Ambrus 2008; Nguyen and Wodon 2015a; Otoo-Oyortey and Pobi 2003). Others tried to look at risk factors for women to get married early (Ikamari 2005; Ferre 2009).

3.1 Early marriage, fertility and income volatility

In most Sub-Saharan-Africa countries, the importance given to marriage payment namely the bride price as a source of consumption smoothing is one of the channel through which income shock affects the local marriage market and age at marriage.

Corno and Voena (2017) explore the relationship between the probability of child marriages and one specific social norm, namely the bride price payment. In a setting of income variability and incomplete credit markets, they found that a negative income shock instrumented by variation in rainfall shock increases the probability of child marriage in the same period, as long as the bride price exceeds the daughter's contribution to home production. However, Hoogeveen et al (2011) find no empirical evidence for a relationship between rainfall shocks and age at marriage while assuming that bride wealth serves to insure against livestock loss. In a working paper, Corno et al (2017) systematically study how marriage market in presence of marriage payment, can be affected by aggregate economic conditions. Based on some theoretical predictions and empirical tests of an equilibrium marriage market model, they show that an agricultural productivity shock associated with a drop in annual crop yield by 10 to 15% due to a drought, increases annual hazard into child marriage by 3% in Sub-Saharan Africa. An in-depth analysis enlighten on the timing of marriage and fertility decision. So, they find that for a specific age group 12 to 24, one more drought reduces the marriage age by 0.04-0.05 years and increases woman's number of children by 0.04. Child girl marriage is one of the key determinants of female reproductive life length and fertility levels (Coale and Treadway, 1986, and Rosero-Bixby, 1996). Dixon-Mueller (1993) investigates the relationship between women's relative position in the couple and fertility. He shows that women who engaged in union at a younger age (before 19) are two to four times more fertile than those who marry after age 25. Harwood-Lejeune (2000) using data from nine Southern and Eastern African countries, estimate that the rising age at marriage explains from one-sixth to one-third of the regional fall in fertility.

The incapacity of parents to smooth consumption particularly in difficult periods, leads them to make costly decision with compromising welfare effects for their daughters and their offspring.

3.2 Early marriage and education

A causal relationship is clearly established between age at first birth and schooling and between age at marriage and educational outcome (Marchetta and Sahn, 2015; Herrera and Sahn, 2015; Glick, Handy and Sahn, 2015). Child marriage can be analyzed therefore either as a cause of lower education outcome or a consequence of poor school attainment. Schultz (1997) argues that educational attainment may delay early child birth, while early marriage and child birth adversely affect educational attainment. The limitation of educational opportunities for young brides is due to the fact that once married they are expected to devote their time to family duties. The importance of early marriage as a major factor of schooling drop out has long been raised (Lloyd and Mensch, 2008; Nguyen and Wodon, 2014b). Jensen and Thornton (2003) investigating the link between early marriage and schooling point out a strong correlation between woman age at marriage and education level. The results indicate that in India women married at age 21 receive three to four years of education while those married before 15 have less than one year of education. Field and Ambrus (2008) try to assess the causal effect of early marriage on female schooling in Bangladesh. They use in a two-stage model, age of menarche as an instrumental variable for marriage age since it is traditionally rare to arrange marriage of girls before they have reached puberty. They find that a delay of one additional year of marriage is associated with 0.3 additional years of schooling and 6.5% higher probability of literacy. In a companion paper, Nguyen and Wodon (2015a) estimate that an additional year of early marriage reduces by 5.7 percentage points the probability of having at least some secondary schooling and by 3.5 points the probability of secondary school completion. Some papers have also analyzed schooling as a determinant of child marriage. In Kenya for instance, Ikamari (2005) shows that education has a statistically significant and strong positive effect on a woman's age at first marriage with the effect remaining robust in the presence of a number of controls. Ferre (2009) using the 1985 Kenyan education reform as an instrument for years of education find that adding one more year of education decreases by at least 10 percentage points the probability of giving birth.

4. Data and descriptive statistics

4.1 Data

The analysis of the relationship between early marriage and fertility is based on the link between women age at first marriage and own fertility and between women age at first marriage and sibling fertility. The data used in this study comes from the fourth demographic health survey (DHS) conducted in 2010 by the National Institute of Statistics (INSD) in Burkina Faso, through the support of main international institutions.

DHS data are designed to be nationally representative, and contain very rich information regarding women such as the age at first cohabitation, the current marriage status, the number of unions, age at first birth, number of siblings, number of children ever born of childbearing women aged 15-49.

The full sample consists of 17 087 women aged 15 to 49. The sample is predominantly composed of women who are currently in union or living with a man. They represent 78.38% of the total number of childbearing age women surveyed. A significant share of women has never been in union (18.25%) and those who were formerly in union are about 3.37%. Since we are interested in early marriage based on age at first marriage, we consider the sub-sample of women currently in union. Among women (13 392) currently living with a man, we observe those who are in their first union and those who have been involved in other unions. The majority of women currently in union are in their first marriage. The proportion of women married once is 88.36% while it is 11.07% for those married more than once, among women currently married. Thus, we restrict our analysis to women currently in their first marriage. In this way we exclude women who are either divorced or not remarried, or married many times or are widowed. These characteristics may influence the potential fertility of women. For instance, women married early may be constrained to be living single or with few children because they lost their husband and then decided not to remarry. For a woman involved once in early marriage who then got remarried, it could be that the willingness of each of her husband to have children may affect the overall number of children ever born of that woman. Following this reasoning, we get a sample of 11 833 observations representing about 70% of the full sample of women aged 15 to 49 years old.

We also disaggregated the data into age cohorts, in order to examine trends over time. In particular, we analyze separately marriage patterns of women aged 15 to 19, 20 to 24, 25 to 29, 30 to 34, 35 to 39, 40 to 44 and 45 to 49.

Figure 1 depicts the distribution of age at first marriage in our final sample. Age at first marriage is between 10 and 39 with a mean around 17.56. It is concentrated between 14 and 20 years old, representing 84% of the sample. The most common age for marriage is 17, reflecting current prevalence in Burkina Faso. The percentage of women married at 17 is 19.18% and 56.31% married before or at 17 years old. This is why contrary to common concept of child marriage defined as any form of union taking place below age 18 (UNICEF), we consider in this study early marriage as all types of union, formal or informal, that took place when the bride was below 17. This is also consistent with the legal framework of marriage in Burkina Faso that sets the minimum age at marriage at 17 for women and only allows girls to marry below 17 in particular circumstances.

According to the current age of women, early marriage seems to be more and more preponderant over time. Table 1 shows the percentage of women married early by age cohort. The proportion of women marrying before age 15 or 17 is smaller among the older women compared with their younger peers. For instance, the proportion of women married before 17 is two times higher among women in the youngest cohort (60%) compared with the oldest one (29.56%). Child marriage is worsening from generation to generation. The same pattern of early marriage is found across generations when analyzing the mean age at first marriage by age cohort. As shown by Figure 2, the mean age at first marriage is positively correlated with woman age cohort. This means that younger women are getting married on average earlier than older women. This observed drop in age at first marriage combined with the increasing share of women marrying early reveal that child marriage is on a rise over time. This situation may be explained by the fast population growth. The pauperization of households due to more difficult economic conditions might also have contributed to worsen the phenomenon of precocious marriage in Burkina Faso.

4.2 Early marriage and socioeconomic characteristics

Table 2 provides some statistics on socioeconomic characteristics for women who are currently in their first union and who married early. The table shows that child marriage is striking in rural areas. 81.54% of women married early come from the countryside. The perpetuation of child marriage in Burkina Faso is rooted in cultural and social norms thriving in traditional societies specifically located in rural areas. Viewed as an ancestral practice to perpetuate, child marriage is made possible through forced or arranged marriages in most ethnic groups. It generally takes place at the time when the future bride is born or during her

early childhood, promise of marriage among parental or social groups is seen as a way to strengthen family or blood tie. Since a wide age gap between spouses is accepted as a social norm in traditional societies, promised girls are married very young to older men, in most cases against a payment assimilated to a dowry transferred to the bride's family in cash or in kind (agricultural land, livestock). This fact is clarified when looking at figure 3 that shows an inverse relationship between spousal age gap and woman's age at first marriage. The younger a woman is getting married, the higher is the age gap with her husband.

In addition to the fact that many girls are married early to older men, they have sometimes to accept to live with other wives. Polygamous unions are widespread in Burkina Faso, despite the predominance of monogamous unions. 57.69% of women married early are engaged in polygamy. One explanation is that polygamous husbands tend to take a new bride younger than the former. Observing the daily life of polygamous families in Burkina Faso, one may notice that the newest who is in general the youngest wife enjoys special treatment from the husband among the spouses. The high fertility potential as well as sexual attraction from young brides could contribute to justify the preference for young girl of polygamous men.

Age at first marriage plays a role in determining the level of fertility of women in Burkina Faso. Marriage is socially accepted as the ideal framework for sexual activity and childbearing. Generally, women with low age at first marriage tend to experience early childbearing and high fertility. Figure 4 depicts this negative relationship between woman's fertility given by the number of ever born children and her age at first marriage. Early motherhood among early marriages reflects women capacity to make more babies throughout their procreative life time. Regarding the statistics described in table 2, we may notice that the average number of children ever born is higher in early marriage (4.58) compared with marriage at mature age (4). Early motherhood is also found among early marriage. On average, women married early experience their first birth at 15 years old, 4 years earlier than women married at a mature age. Marriage to first birth interval expressed in number of months corroborates the evidence of early motherhood among teen brides. The mean interval for first conception leading to live birth is lower in early union (31.15 months) than in union contracted at adult age (70.63 months). A frequent sexual activity at the onset of young bride marital life may explain why they relatively give first birth more rapidly. The reason behind is that younger brides are less able to refuse sex as a result of lower decision-making power. Moreover, this is reinforced by domestic and conjugal violence, seen most of the time by young brides as normal husband domination and social norm.

Early marriage may also be linked to parents' fertility. Figure 5 shows the correlation between parental fertility approximated by the number of woman's siblings and age at first marriage. The fitted line, sloping downward is almost flat above 5 siblings and below 6 siblings for values of age at first marriage ranging between 10 and 39 years. This inverse relationship, albeit weak, is consistent with the idea that girls from larger size household are more likely to marry earlier. From the table, we observed that women married early have on average higher number of siblings than those married at later age, even though the difference in mean number of siblings is lower than 1. The low living standard observed in families with many children sometimes lead parents to find strategies to cope with their misery. In that way, child marriage may be an enormous relief for poor households. Statistics clearly show that early marriage is more prevalent in the sphere of poor people. The data show that among women married early the proportion of those living in households of lowest wealth quintile is larger (21.69%) than their counterpart married as adult (15.07%). Furthermore, poor education outcome is also associated with child marriage. The data suggest that the percentage of uneducated women is 10% higher in early marriage than in adulthood marriage.

Emphasizing the analysis upon religion membership, Muslims are predominant, followed by the Catholics and then the Animist. However, it is interesting to note that the share of Muslim women as well of Animist involved in early marriage is higher than for mature marriage for which the proportion of Catholics is lower. The fact that the practice of polygamy is allowed among Muslims and forbidden under Catholic prescriptions may explain somehow why Muslim girls are more involved in early marriage. As discussed further up, polygamy is associated with child marriage in part because polygamous men may prefer take on as new bride a young girl either for desirability or for fertility purposes. The involvement of animism in child marriage may probably be due to its reliance on customs, ancestral practices and social norms.

5. Econometric Specification

5.1 Age at first marriage and own fertility

To capture the link between age at first marriage and woman's fertility, we specified a simple basic econometric model which explains fertility by age at first marriage. Specifically, we estimate the following equation by OLS method using the sample of ever-married women who are currently involved in their first union:

$$Y_i = \alpha + \beta . Ageatmarriage_i + \gamma . X_i + \varepsilon_i \quad (1)$$

WhereY_i, the dependent variable denotes the fertility of woman i approximated by the number of children ever born. Alternatively, we introduce another dependent variable that is interval between marriage and first birth. $Ageatmarriage$ is a continuous variable corresponding to the age at which woman enters in her first union. The vector X_i is a set of individual and household control variables. It covers woman i socioeconomic characteristics like age, dummies for woman highest level of education[2], religion[3], a dummy equal 1 if woman i knows at least one contraceptive method and a dummy equal 1 whether the respondent is currently working. The vector also includes information about woman's family background such as the number of siblings reflecting the family size where she has been brought up before getting married. The household characteristics include dummy for rural or urban location, dummies for household wealth (we use the wealth index calculated by DHS, which is a five-point categorical variable ranging from being among the poorest to being among the richest, with the poorest category used as the omitted category).

The descriptive statistics based on the sample of ever-married women who are currently involved in their first union shows that there is a non-negligible share of women (13%)[4] who gave their first birth before entering into their first union (see table 3). In this context, the marriage timing of those women could tend to be longer because they may not find men who are willing to marry women who already got children. On the other hand, those women may tend to have higher number of children ever born being in their current marriage. For this specific reason, we also estimate equation 1 restricting the sample to women having given their first birth after engaging into their current union. In this case, as the number of children that woman may have being married cannot affect the timing of marriage, age at first marriage in our model (equation 1) may be reasonably considered as exogenous. Therefore, we may pretend to analyze the likely effect of age at first marriage on fertility.

5.2 Age at first marriage and parental fertility

We focus here on the analysis of the correlation between fertility of parents and the age at first marriage of their daughters. To carry out this analysis we run the following regression:

$$Ageatmarriage_i = \alpha + \beta.Z_i + \gamma.X_i + \varepsilon_i \quad (2)$$

[2] Highest level of education is categorical variable with four modalities such as no education considered as a baseline, primary education, secondary education and higher education.

[3] Religion covers five dummies whereby no religion taken as a baseline, Muslim, Catholic, Protestant, Traditional

[4] Table 3 provides the percentage of women whose first marriage comes before first birth (86.86%).

$Ageatmarriage_i$ defines the age at first marriage of woman i. Z_i is our independent variable of interest referring to fertility outcome of woman's parents. This variable is alternatively introduced in the equation under four measures such as the number of woman's siblings, the number of living sisters, the number of living brothers, the birth rank of woman. X_i is a vector of individual and household controls that includes age cohort, wealth quintiles and religion dummies. It also includes dummies for capturing whether the woman is uneducated, whether she works, whether she has one co-wife or more, whether her husband is literate, and whether she lives in a rural area, and the spousal age gap.

We also look at whether parents' fertility may lead them to marry their daughters before their reach adulthood. To shed light on this issue, we split down the dependent variable, age at first marriage into two categories in accordance with child marriage age threshold. Our new dependent variable referring to early marriage is defined as a dummy taking the value 1 whether the woman married before 17 years old. We run this equation using linear probability model. In addition to the number of siblings capturing parental fertility, we also include some controls stemming from equation 2 above. We augmented the equation by the interactions between place of residence and the number of siblings, the interaction between woman education and number of siblings, and the interaction between religious belief and number of siblings.

6. Results

6.1 Age at first marriage and own fertility

Table 4 reports the results of the relationship between woman's fertility and age at first marriage from OLS estimations. The dependent variables are the number of children ever born per woman and the interval between marriage and first birth. The results are reported for both dependent variables separately.

The results confirm a negative relationship between age at first marriage and woman's potential fertility. The number of children ever born decreases as the age at first marriage increases. Women marrying at lower age tend to have higher number of children ever born. The estimates are statistically significant at 1% with the expected sign.

Furthermore the results show that marriage to first birth interval is increasing with the age at first marriage. Lower age at first marriage is associated with smaller interval to first birth. Women married earlier tend to give first birth in shorter time after getting married. This

positive relationship is statistically significant at 1%. This finding contributes to explain the larger life time fertility of women who got married earlier as it clarifies that the age gap between first marriage and first birth is lower in union contracted earlier. The decline in fertility following an increase in age of women at first marriage may be attributed to biological causes. From medical point of view, older women present lower fecundity potential. This is also consistent with the analysis raising the important incidence of marriage to first birth interval in the life of women with increasing responsibilities at mature age (Khan and Raeside 1998). First birth interval not only affects the length of rest of birth intervals but also affect reproductive pattern of women. According to Rao and Balakrishnan (1989), early birth interval increases the chances of second, third intervals etc.

Other interesting findings concern controls. Fertility is varying with the place of residence. Compared to urban areas, fertility is significantly higher in rural areas where the practice of child marriage is predominant. Regarding the education level, women with at least primary education, shows lower overall fertility. Moreover, women from larger size household present a higher fertility level indicating the intergenerational transmission of fertility.

Our result holds when we restrict the analysis to the other samples. However, in *the interval to first birth* equation, the coefficient of age at first marriage turns out to be negative and significant at 1% level within the specific sample of women who got first married before giving first birth. For those women, marriage to first birth interval decreases as age at first marriage increases. The fact that women married older without having given birth before, leads them regarding the limited remaining time to reach menopause to give birth as soon as possible. This may explain why women marrying at latter age give first birth more quickly.

6.2 Parental fertility and the risk of child marriage

Table 5 presents the results from OLS estimations of the link between age at first marriage and parental fertility. The sample of women currently in first marriage has been considered. The results are reported for five alternative measures of parental fertility as explanatory variables such as the number of siblings, birth rank, the number of living sisters, the number of living brothers and the number of living siblings (sum of living brothers and sisters). The results suggest that the number of woman's siblings may have an influence on the age at first marriage. The coefficient on siblings is negatively correlated with age at first marriage and statistically significant at 1%. Age at first marriage is diminishing as the number of siblings is increasing. Specifically, as the number of siblings increases age at first marriage decreases

much higher among women with no religious belief than it does among religious women although the estimates also show that age at first marriage is not associated with religious belief in Burkina Faso.

The negative relationship between age at first marriage and parental fertility reflects the fact that girls coming from larger size households would be more likely to get married at younger age. The pressure on household resources due to the competition between siblings leads parents to be willing to face this stress by sending their child to work or offering their daughter in marriage. The existence in Burkina Faso of traditional weddings requiring the groom or his family to bring a valuable gift like cows or a cash payment in the form of dowry may also motivate poor households to marry earlier their daughters. The estimates shed light on that, by showing that in richest households, woman's age at first marriage is significantly 1.024 higher than it is in poorest families. In addition, living in rural place is associated with lower age at first marriage. In a context of rural area, child marriage is widespread and coexists with a striking poverty of households. We consequently expect women to be married earlier in rural location.

Education is also related to age at first marriage. Women with no education got married at lower age than their peers with a minimum level of education. It is also important to notice that age at first marriage is significant at 1% level higher in younger age cohort. Women from the oldest cohort are getting married 2.19 years later in comparison with those from the youngest cohort.

In model 2, we found that the birth rank of woman is inversely related to the age at first marriage, although our estimate is not statistically significant. As for the number of living sisters or the number of living brothers introduced in the model, we do not observe any evidence in relation to age at first marriage. Even after introducing in the model the number of living siblings as the sum of living brothers and sisters, the relationship does not show up.

Table 6 reports the estimated coefficients from linear probability regression taking risk of child marriage as dependent variable. We find that family size plays an important role in the practice of child marriage. The number of siblings has a significant and positive effect on the probability of early marriage. This means that women from a large size family are more exposed to the risk of being married before 17. Moreover, child marriage is more likely to occur in households with poor livelihood conditions. When parents cannot feed or meet basic needs of their children and more specifically those of their daughter, they would prefer to marry her.

We also find that child marriage is associated with poor education outcomes. The coefficient for not being educated is positive and statistically significant. Women with no education are more likely to marry early since they are supposed not to be able to support their parents, regarding their lower future income expectations. Another explanation to this is that because girls are still considered in many parts of Burkina Faso as being predetermined to devote their entire life to take care of their husband and future family, parents do not deserve any attention to their daughters who probably undergo discrimination in household resource allocation. Investing in girl is therefore useless and is a waste of resources from the view of dominant feudal system thriving for the most part in the countryside. We may observe through the data that ¾ of women currently being in their first marriage are located in rural areas. They are thus powerlessly subjected to the social norms enforced by their environment. This situation is at the origin of the poor education level of most women. The descriptive statistics reported in table 3 point out that a large share of women are not educated (about 81.5%). This proportion is higher in the sub-sample of women who married early (88%), as reported in table 2.

The risk of early marriage is also correlated with husband literacy. At 1% significant level, the probability of child marriage is greater among women marrying illiterate husbands. Illiterate men are more involved in agriculture sector requiring a strong labor force. They are more likely to express a desire for younger brides who are in general physically better at work. Moreover, married early, women may tend to have many children who may be used latter on as labor force by the household.

It is also interesting to mention that being a believer is negatively linked to the risk of child marriage. Being religious is associated with higher risk of early marriage even though the estimate appears to be insignificant at 10%. This is not consistent with the idea that child marriage is accepted among religious groups in the sense that it allows keeping girls purity and preventing them from having sex before entering in union. The lack of significance of religious belief may be related to the negligible share of misbelievers in the sample (0.75%).

The interaction between *Sibling* and *No education* is shown in column 2. Despite we underlined that uneducated women display a higher risk into early marriage, the negative interaction coefficient of *sibling* x *No education* suggests that the effect of siblings on child marriage likelihood is more concentrated among educated women. Thus, one less sibling decreases much more the risk of early marriage among educated women compared to their uneducated peers.

Column 3 shows that the interactions between rural and sibling is positive and statistically significant suggesting that girls residing in rural areas and living within larger size household have a higher probability of falling into early marriage. The marginal effect of fertility on child marriage risk is more severe in rural areas because households face extreme aggregate economic conditions. The poor education outcome associated with lower return on labor market, the frequency of agricultural shocks leading to lower productivity, the difficult access to formal credit and insurance markets tend to increase the vulnerability of rural households. This situation combined with the high level of fertility, explain why the incidence of child marriage risk resulting in higher fertility is larger in rural areas.

When interacting the dummy *No religion belief* with *Sibling,* we got in column 4 a significant and positive coefficient suggesting that the risk into child marriage resulting from having one more sibling is greater among misbelievers. However, religious women have a higher likelihood to enter marriage earlier than women with no religion belief. This may reflect the nonexistence of any marriage rules as far as bride age is concerned within different religious groups associated with the desire to preserve girl virginity.

The risk of early marriage stemming from higher fertility is greater among women from traditional religion than among women from modern religion like Catholicism or Protestantism. The strong belief in ancestral practices combined with cultural and social norms about girl virginity conservation before marriage contract are more hostile to female child marriage and remain stronger within traditional practices than they do within the other religions (modern).

7. Conclusion

Child marriage has worldwide received an increasing attention due to its remarkable consequences on human capital accumulation and economic development (Wodon, Male, Nayihouba, et al., 2017). The perpetuation of social and cultural norms explains somehow why such a harmful practice persists.

This paper is an attempt to explore the relationship between fertility and the timing of marriage, specifically the risk for girls to fall into child marriage. First, we look at the correlation between woman potential fertility and the age at which she first get married. We find that the number of children ever born per woman decreases with the age at first marriage. Moreover, marriage to first birth interval is smaller for a lower age at first marriage, probably reflecting a longer fertility life time of younger brides. Second, we investigate the relationship

between the timing of marriage and the number of siblings a bride has had as an indication of the fertility level of her parents. The result shows that age at first marriage and the number of siblings are negatively related. An increase in parental fertility reduces the marriage timing of girls. Third, we also examine whether household size may exert a pressure on parents' willingness to accept or push consciously their girls into early marriage. We find that parental fertility significantly determines the risk of falling into early marriage. The risk increases with the number of siblings. The low welfare states of potentially fertile families coupled with hostile customary norms contribute to early marriage proliferation in Burkina Faso.

Our findings highlight the importance of fertility as a potential cause of child marriage, possibly accelerating population growth. Policies based on law enactment banning child marriage need therefore to be complemented by concrete measures on fertility control or family planning. It is so useful to empower girls with skills and good education. This could on one hand increase their ability to plan family size and on the other hand to raise the opportunity cost of child rearing. For an accruing effectiveness of such policies, we suggest to emphasize the measures on fertility reduction in rural areas. Furthermore, raising the awareness on the disastrous practice of child marriage among the believing population more specifically among traditional religion adepts would make the fight against child marriage more successful. Yet a better understanding of economic stakes of fertility is crucial for economist and policy makers to tackle early marriages by designing successful policies. Is early marriage an intergenerational legacy? Does it reflect household inability to face extremely economic conditions? Do female and male child marriages have the same patterns?

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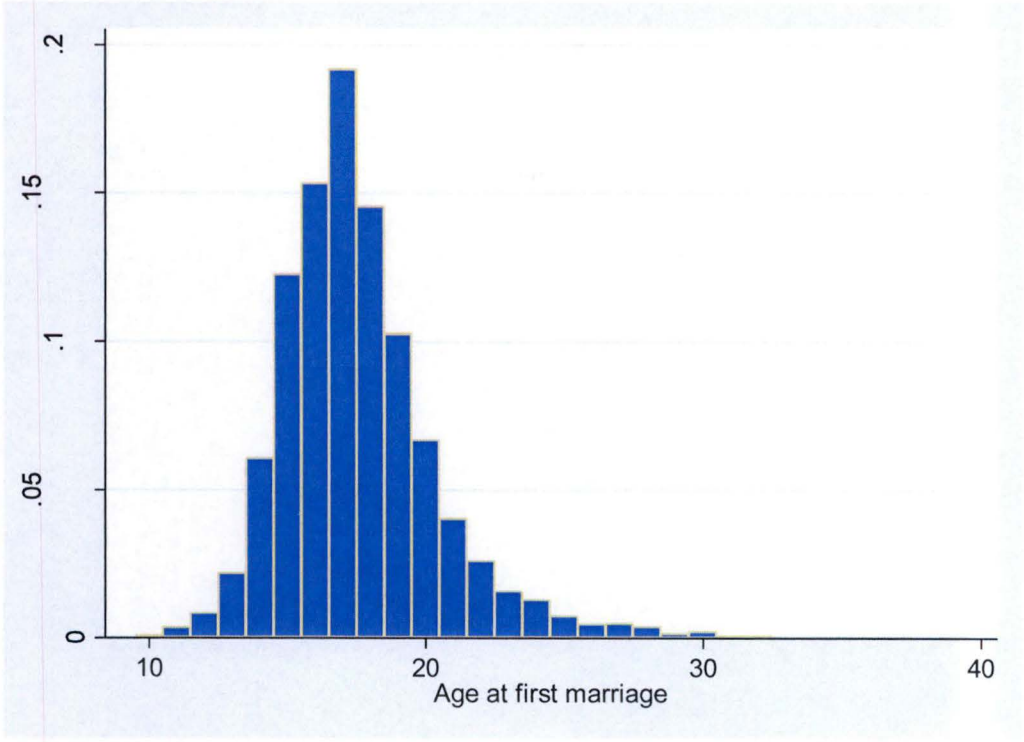
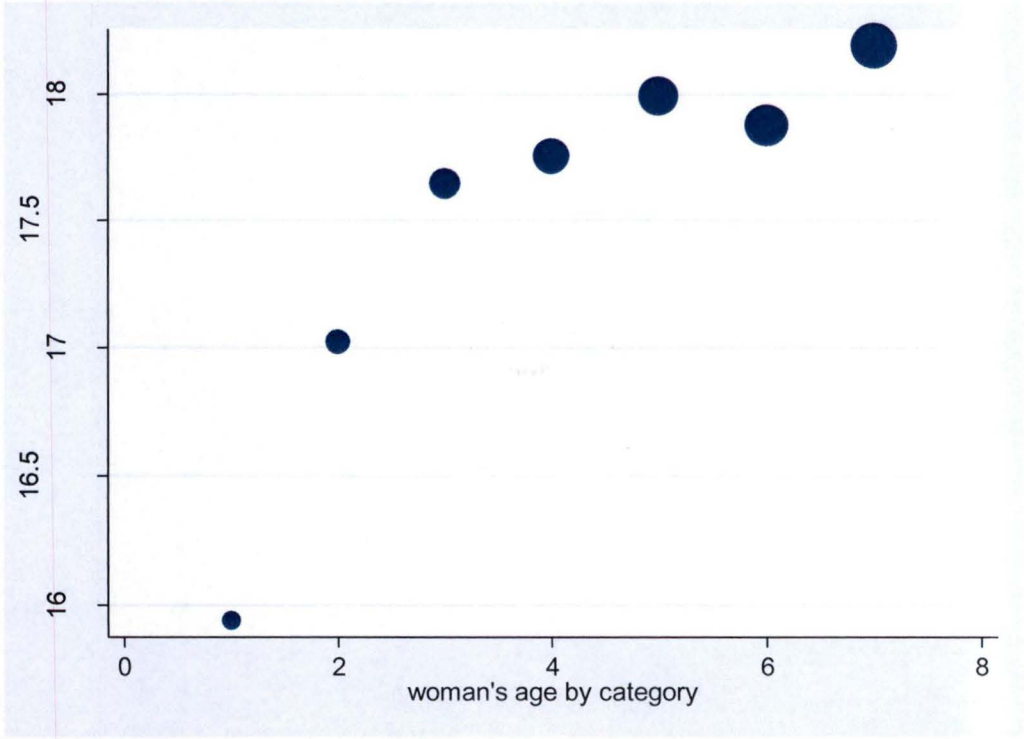
Tables and Figures

Figure 1: Distribution of age at first marriage



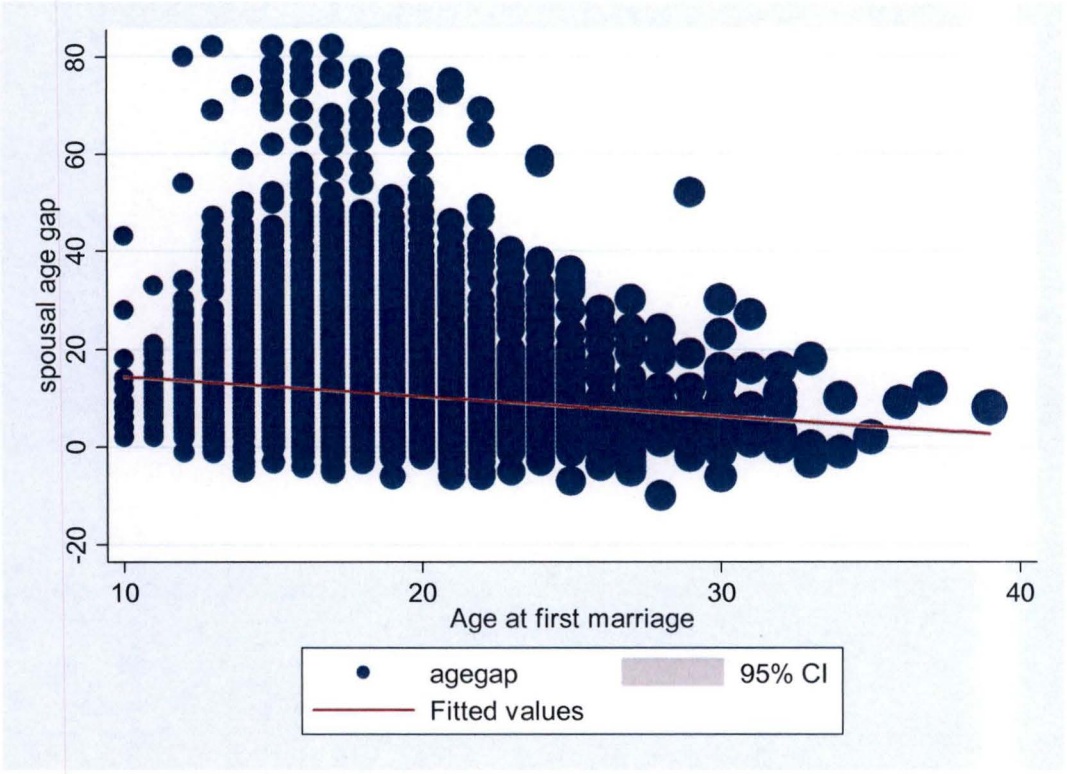
Source: Own estimations based on 2010 DHS survey. The sample is of ever-married women currently at first union

Figure 2: Trend in age at first marriage



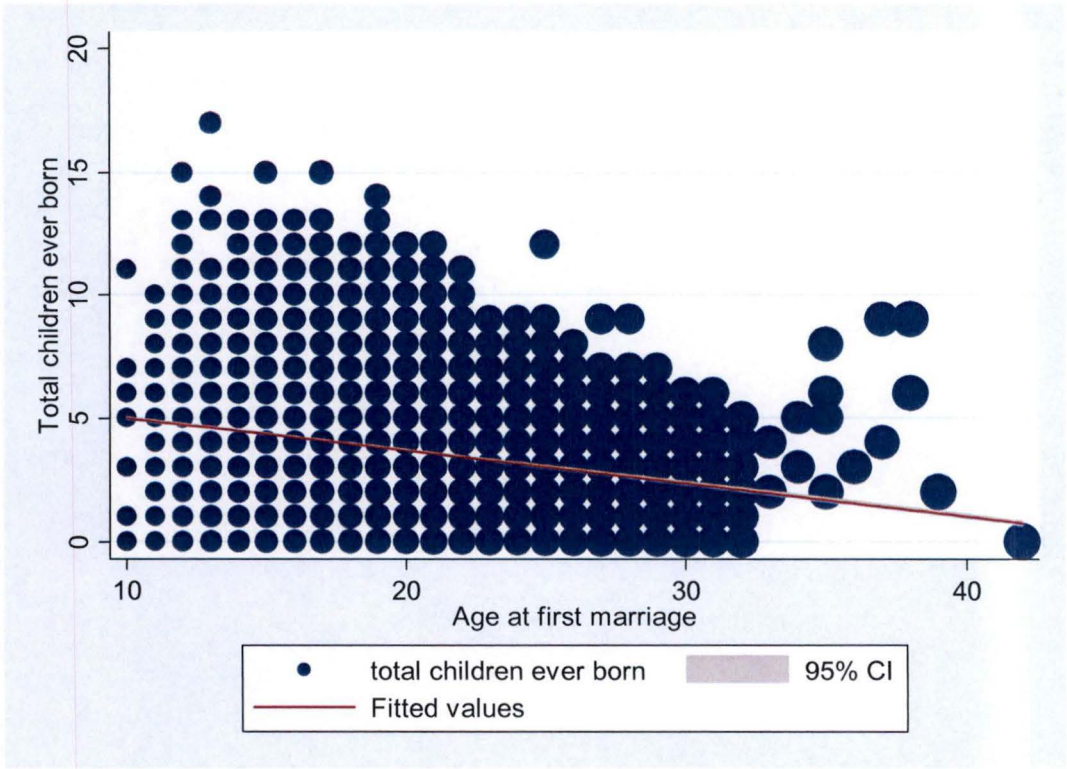
Source: Own estimations based on 2010 DHS survey. The sample is of ever-married women currently at first union

Figure 3: Age at first marriage and spousal age gap



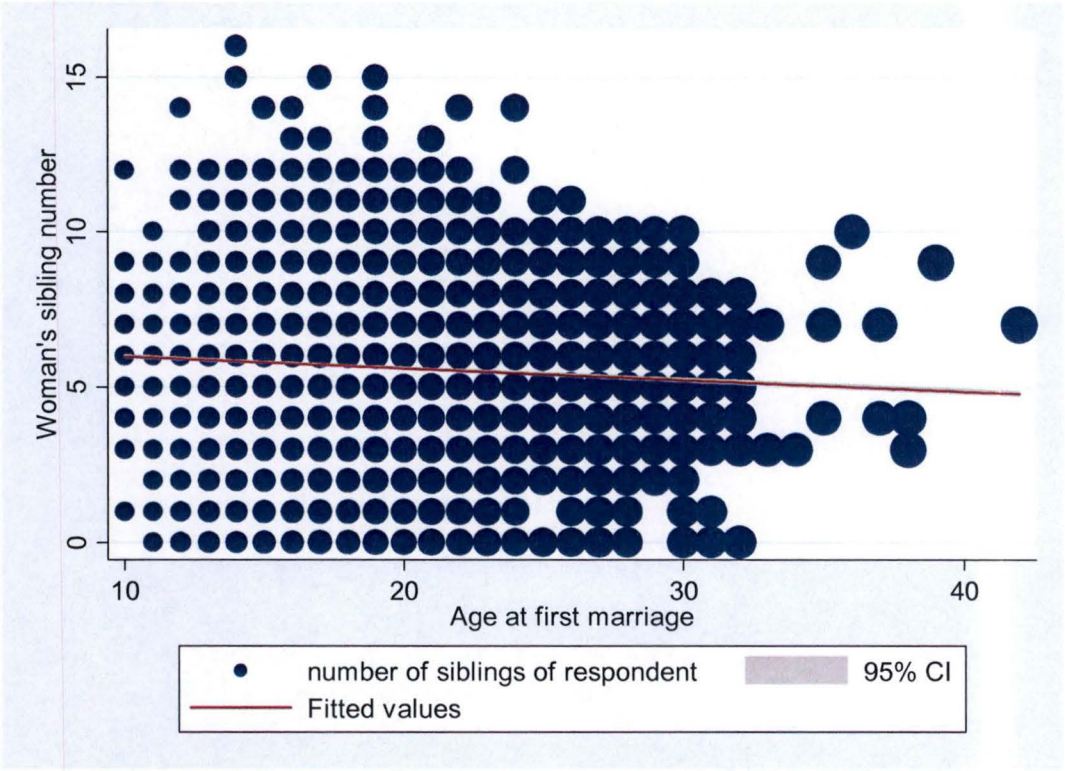
Source: Own estimations based on 2010 DHS survey. The sample is of ever-married women currently at first union

Figure 4: age at first marriage and own fertility



Source: Own estimations based on 2010 DHS survey. The sample is of ever-married women currently at first union

Figure 5: Age at first marriage and parental fertility



Source: Own estimations based on 2010 DHS survey. The sample is of ever-married women currently at first union

Table 1: Proportion of women married early by age cohort

	Married before 15		Married before 17	
	%	Total N	%	Total N
Cohort 15-20	15.99	938	60.02	938
Cohort 20-25	10.63	2,449	38.22	2,449
Cohort 25-30	8.91	2,45	35.80	2,45
Cohort 30-35	9.52	2,155	36.29	2,155
Cohort 35-40	7.31	1,576	32.23	1,576
Cohort 40-45	8.97	1,284	34.11	1,284
Cohort 45-50	6.74	981	29.56	981
Total	9.55	11,833	37.13	11,833

Source: The statistics are based on the sample of ever-married women currently at first union aged 15 to 49 from the 2010 DHS survey implemented in Burkina Faso

Table 2: Characteristics of women currently at first marriage by early marriage

	Married before 17	Married in the year of 17 or after
Family background		
Average number of siblings	5,91	5,70
Individual characteristics		
Average birth order	2,53	2,41
Average number of children ever born	4,58	4,00
Average birth intervals(in month)	31,15	70,63
Mean age	29,98	32,13
Mean age at first marriage	15.00	19.02
Mean age at first birth	16.72	20.40
No education	87,92%	77,34%
Do not work	22,44%	18,97%
Religion		
No religion	0,80%	0,73%
Muslim	67,91%	59,54%
Catholic	15,61%	25,58%
Protestant	4.77%	6.02%
Traditional	10,56%	7,81%
Union characteristics		
Engaged in polygamous union	57,69%	60,91%
Mean spousal age gap	12,13	10,82
Husband not educated	84,34%	74,31%
Household characteristics		
Belongs to Poorest quintile	21,69%	15,07%
Belongs to Richest quintile	13,84%	23,98%
Lives in rural area	81,54%	70,39%

Source: The statistics are based on the sample of ever-married women currently at first union aged 15 to 49 from the 2010 DHS survey implemented in Burkina Faso

Table 3: Summary statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Number of siblings	11833	5.684019	2.654228	0	99
Number of children ever born	11833	3.928082	2.672605	0	15
Birth interval	10997	56.00782	184.0992	0	996
Birth order	11651	2.481332	3.409564	0	99
Age at first marriage	11833	17.56216	2.859993	10	39
Age at first birth	10997	19.01637	3.003167	12	37
Married before 17	11833	.3713344	.4831821	0	1
Married before 15	11833	.0954111	.2937944	0	1
First marriage before first birth	11833	.8686724	.3377726	0	1
No education	11833	.8149244	.4112067	0	9
Does not work	11833	.8035156	.461149	0	9
Engaged in polygamous union	11833	.7050621	3.271399	0	99
Lives in rural area	11833	.7452886	.4357173	0	1

Source: The statistics are based on the sample of ever-married women currently at first union aged 15 to 49 from the 2010 DHS survey implemented in Burkina Faso

Table 4: Correlation between age at first marriage and own fertility-OLS regression

	Full sample of women currently at first marriage		First marriage before first birth		First birth before first marriage		Completed fertility women aged 49	
	Total children ever born	Interval to first birth	Total children ever born	Interval to first birth	Total children ever born	Interval to first birth	Total children ever born	Interval to first birth
Age at marriage	-0.242***	12.188***	-0.259***	-0.492***	-0.164***	0.000	-0.188***	8.252*
Current age	0.259***	-0.678***	0.261***	0.250***	0.219***	0.000	-	-
Work outside	-0.105***	-1.623	-0.091***	-1.874***	-0.161	0.000	0.302	-29.318
Wealth	-0.000***	0.000**	-0.000***	0.000**	-0.000***	0.000	0.000	-0.000
Sibling	0.033***	0.993	0.035***	-0.051	-0.014	0.000	0.094	5.620
Rural	0.279***	-22.235***	0.276***	0.830	0.303*	0.000	1.104**	-35.274
Contraception	0.417***	-4.997	0.396***	-2.983**	0.201	0.000	-0.505	60.673
Litterate husband	-0.064***	3.306	-0.078***	0.040	-0.083	0.000	-0.791	48.449
No education	(base)	(base)	(base)	(base)	(base)	(base)	(base)	(base)
Primary education	-0.149***	9.362	-0.153***	-0.444	-0.410**	0.000	-0.988	251.558***
Secondary education	-0.223***	10.672	-0.223***	1.072	-0.511**	0.000	-1.630	4.988
Higher education	0.026	-57.260**	0.043	9.033***	-0.194	0.000	-2.730	13.296
_cons	-0.436***	-120.559***	-0.284**	26.857***	0.636	996.000	9.906***	-152.946
N	11833	10997	10279	9443	356	356	150	149
r2_a	0.734	0.048	0.743	0.021	0.671	.	0.124	0.079

legend: * p<.1; ** p<.05; *** p<.01

Table 5: Correlation between age at first marriage and number of siblings-OLS regression

Dependent variable :	Age at first marriage					
Variable	model_1	model_2	model_3	model_4	model_5	model_6
Siblings	-0.043***					
Birthorder		-0.008				
Living sisters			0.009			
Living brothers				0.007		
Living siblings					0.006	
Spousal age gap						-0.026***
No religion belief * sibling	-0.358***					
No religion belief	1.954***	0.026	0.032	0.031	0.032	0.086
Cohort 15-19	(base)	(base)	(base)	(base)	(base)	(base)
Cohort 20-25	0.938***	0.945***	0.947***	0.947***	0.947***	0.960***
Cohort 25-30	1.577***	1.577***	1.580***	1.580***	1.580***	1.582***
Cohort 30-35	1.696***	1.680***	1.686***	1.686***	1.686***	1.714***
Cohort 35-40	2.031***	2.017***	2.022***	2.023***	2.023***	2.046***
Cohort 40-45	1.955***	1.946***	1.955***	1.955***	1.956***	1.981***
Cohort 45-50	2.271***	2.279***	2.289***	2.290***	2.292***	2.311***
Work outside	0.177***	0.174***	0.173***	0.173***	0.173***	0.186***
Litterate husband	0.152***	0.152***	0.151***	0.151***	0.151***	0.122***
Rural	-0.258***	-0.261***	-0.262***	-0.261***	-0.261***	-0.236***
No education	-1.213***	-1.201***	-1.201***	-1.202***	-1.201***	-1.153***
Poorest	(base)	(base)	(base)	(base)	(base)	(base)
Poorer	0.079	0.070	0.071	0.071	0.071	0.058
Middle	0.201**	0.205**	0.207**	0.207**	0.207**	0.209***
Richer	0.352***	0.337***	0.337***	0.337***	0.337***	0.346***
Richest	0.947***	0.942***	0.940***	0.940***	0.940***	0.943***
_cons	16.980***	16.755***	16.712***	16.715***	16.705***	16.952***
N	11833	11651	11651	11651	11651	11833
r2_a	0.118	0.115	0.115	0.115	0.115	0.123
legend:	* p<.1; ** p<.05; *** p<.01					

Table 6: Effect of parental fertility on the likelihood of early marriage-Linear probability model

Dependent variable :	1 if married before 17				
Variable	model_1	model_2	model_3	model_4	model_5
Sibling	0.007***	0.012***	0.001	0.007***	0.060***
No education * Sibling		-0.006			
Rural * Sibling			0.008**		
No religion belief * Sibling				0.054**	
Muslim * Sibling					-0.055**
Catholic * Sibling					-0.054**
Protestant * Sibling					-0.051**
Traditional * Sibling					-0.050**
No education	0.112***	0.149***	0.113***	0.112***	0.092***
Rural	0.089***	0.088***	0.042*	0.089***	0.091***
No religion belief	-0.009	-0.009	-0.008	-0.301**	
Literate husband	-0.022***	-0.022***	-0.022***	-0.022***	-0.015**
_cons	0.181***	0.150***	0.213***	0.183***	-0.101
N	11833	11833	11833	11833	11833
r2_a	0.025	0.025	0.025	0.025	0.035
legend:	* p<.1; ** p<.05; *** p<.01				