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GIRL INTERRUPTED! THE IMPACT OF CHILD MARRIAGE ON WOMEN'S EDUCATIONAL ATTAINMENT IN ZAMBIA

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ABSTRACT

Human capital acquisition is not only pivotal for overall growth and development, but also plays a critical role in advancing the economic empowerment of women and young girls. However, significant barriers continue to impede girls and women from pursuing further education in developing countries. Among the various factors affecting women's education, child marriage frequently emerges as a significant inhibitor. Despite ongoing efforts to eliminate the practice, it remains prevalent in Sub-Saharan Africa and South Asian countries.

Utilising data from the 2018 Demographic and Health Survey (DHS), this dissertation investigates the effects of child marriage on educational outcomes for women in Zambia. Adopting an instrumental variable methodology to account for endogeneity and reverse causality, this paper explores whether marrying below the age of 18 disrupts educational attainment and, consequently, impedes the development of human capital among young Zambian women. Consistent with previous studies on child marriage and education, the results from this paper suggest that being a child bride significantly reduces educational attainment by 1.4 years and reduces the probability of secondary school completion for girls in Zambia by 21 percentage points. In terms of educational attainment, girls married between the age of 10-14 are the most adversely affected.

SECTION 1: TOO YOUNG TO BE A BRIDE

Worldwide, approximately 129 million girls are not enrolled in school and, although 49% of countries have attained gender parity in primary school completion, a substantial gap persists at the secondary level (UNICEF, 2022). In developing countries, girls' completion rates in secondary school are lower than those for boys, with 36% of girls completing lower secondary compared to 44% of boys. Furthermore, only 21% of girls complete upper secondary in comparison to 26% of boys (Saavedra et al., 2021). The benefits that education can provide to young girls extend beyond the direct acquisition of knowledge. Higher educational attainment has been linked to improved maternal health (Weitzman,2017), reduced child mortality (Grépin and Bharadwaj,2015), higher labour force participation (Abraham et al.,2017), and a decrease in violence against women (Zhou and Su, 2021).

The global prevalence of child marriage is 19%, with approximately 640 million girls and women today cumulatively being victims of child marriage (UNICEF,2023). The practice of child marriage is most widespread in low and middle-income countries (Koski et al., 2017), in Sub-Saharan Africa and South Asia. Around 290 million girls marry as children in South Asia, while 127 million girls marry as children in Sub-Saharan Africa, representing around 45% and 20% respectively of the global total of child brides (UNICEF, 2023). In comparison, the levels of child marriage in East Asia and the Pacific (15%) and Latin America and the Caribbean (9%) remain low (UNICEF,2023).

While various factors contribute to the weaker educational attainment for girls, child marriage is a significant disruptor of girls' educational progress globally (Delprato et al., 2015; Field and Ambrus, 2008; World Bank, Nd). Girls who marry at a younger age have a higher probability of withdrawing from school to fulfill marital and maternal responsibilities (Singh and Samara, 1996; Lloyd and Mensch,2008; Amin and Suran;2009). In Uganda, for example, survey results found that more than half of the reasons provided by school principals for why girls drop out of primary school were related to pregnancies (40.2%) and child marriage (27.6%) (Wodon et al.,2016).

Child marriage is influenced by various factors, often differing across groups and countries. A substantial body of research in low to middle-income countries highlights economic insecurity (UNICEF,2015; Paul,2019), social and gender norms (Petroni et al.,2017), concerns about girls' sexuality (Sarfo et al.,2022) and the absence of legal structures (Scolaro et al.,2015; Wodon at al.,2017) as key drivers of child marriage. In many developing regions, the intersection of child marriage and low educational attainment significantly undermines women's empowerment, specifically their ability to make choices (Male and Wodon,2018). Kabeer (2008) cited by Male and Wodon (2018) divides the capacity to make choices into three categories: achievements, resources and agency. If one considers the effects that child marriage has on a girl's education, all three aspects of choice are adversely affected. For instance, child brides are often young and poor, and by leaving school early due to child marriage, they attain little educational achievement and face limited access to resources such as income generated through employment (World Vision,2022). The lack of education and access to resources subsequently diminishes their household bargaining power within the marriage (Parsons et al.,2015). This reduced agency leaves child brides with less likelihood of participating in financial decisions in their household (Becker et al, 2006) or making choices regarding entry into the labour force (Wodon et al., 2017) thus reinforcing a cycle of deprivation and poverty (World Vision, 2022). Additionally, women marrying below the age of 18 are at a greater likelihood of experiencing adverse reproductive health consequences that may lead to death, as well as an elevated risk of intimate partner violence (UNFPA,2017; Godha et al.,2013; Santhya et al.,2010; Fan and Koski,2022). This not only poses a serious threat to the well-being of women but also risks the escalation of poverty and inequality in developing countries as the impacts of child marriage often transmit to the next generation (Parsons et al.,2015).

Using Zambia as a case study, a country grappling with one of the highest child marriage rates in Sub-Saharan Africa at 31.4% (DHS,2015), this dissertation investigates the relationship between child marriage and woman’s educational attainment. The bulk of the literature on child marriage in Zambia has focused on the drivers associated with child marriage. To my knowledge, this dissertation is the first study to examine the effect that child marriage in Zambia specifically has

on educational outcomes for women in the country[1]. Using both OLS methods and an IV approach to address issues of reverse causality[2], the results in this paper are consistent with prior literature, and reveal that child marriage indeed hinders the educational outcomes of women in Zambia. The results show that being married between the ages of 10-14 and 15-17 is associated with a decrease in the average years of education attained by 1.12 and 0.38 respectively. Additionally, being married between the ages of 10-14 and 15-17 decreases the probability of girls completing secondary schooling by 15 and 8 percentage points respectively.

SECTION 2: WHERE AND WHY IS CHILD MARRIAGE STILL PREVALENT?

2.1 Poverty and Economic Insecurity

Economic hardships have consistently emerged as a major factor driving child marriage in developing countries. Women in impoverished households have a higher likelihood of entering into marriage before the age of 18 in comparison to women living in wealthy households (UNICEF, 2006). Paul (2019) finds that in India, girls from the poorest households are 30% more likely to enter child marriage, whereas coming from the richest households decreases the chances of entering child marriage by 41%. A similar finding was found in Bangladesh where women from the poorest households had 18% higher odds of marrying below the age of 18, than those women from the richest households (Islam et al.,2016).

Although cultural norms are often viewed as separate drivers of child marriage, there exists a subtle intersection where both cultural traditions and economic factors contribute to the prevalence of early marriage. The more recent literature has come to appreciate the interlinkage of gender, culture, and economic factors when it comes to the frequency of child marriage. In Sub-

[1] A previous paper by Delprato et.al (2015) conducts a similar study on child marriage and educational outcomes, however, the paper includes 36 countries and does not focus solely on Zambia.

[2] While child marriage may inhibit girls from completing school, education may also work in preventing child marriage (Singh and Espinoza Revello, 2016) making it difficult to determine the direction in which the casual relationship flows. Moreover, there remains the possibility that girls who are academically challenged may opt to leave school and marry early.

Saharan Africa, the custom of marriage payments (also known as lobola) made to the bride's family is a common practice at the time of marriage. Where parents feel burdened by economic hardship, these bride payments may serve as a gain in income, prompting them to marry off their daughters at an early age, in order to obtain this payment (Birech, 2013; Kok et al., 2023).

To better understand this interrelationship, Corno and Voena (2023) develop a dynamic discrete model to explain how negative shocks to household income can affect child marriage through bride price payments. Their model predicts that in communities where bride price payments are required at the time of marriage, child marriage can be a strategy used by the bride's parents to smooth consumption. The primary assumption of this model is that households do not have access to credit markets, preventing them from borrowing or saving. It is therefore the case that when there is a negative shock to household income, if the value of obtaining bride price is greater than the daughter's contribution of service to the household budget, then parents will choose to obtain the bride price as insurance to smooth consumption and increase their marginal utility in the given period. Therefore, where capital markets are imperfect, as long as the bride price in any given period exceeds the value of services a daughter provides in her household, a negative shock to income will increase the probability that the daughter marries in that period.

Estimating this model using data from rural Tanzania and exploiting the variation in rainfall shocks on income, Corno and Voena (2023) find that negative shocks to income during a girl's teenage years increase the probability of her being married before the age of 18. In particular, they find that a rainfall shock (positive or negative) relative to the historical average at ages 17 -18 is associated with an increase in the probability of being married early by 7.7 percentage points.

Examining the impact of rainfall in Sub-Saharan Africa and India, Corno et al. (2017) find that during drought periods, the probability of becoming a child bride increases in Sub-Saharan Africa. However, the opposite is observed in India, where drought periods are negatively associated with early marriage. In India, families tend to delay marriage during droughts because the bride's family is responsible for paying a dowry to the groom's family. The authors also find that while droughts

may serve as a proxy for negative output shock to income in both regions, floods are an inconsistent proxy given that the effect varies dependent on the crop. In regions that do not cultivate rice in India, floods have a negative effect and decrease yields, thus decreasing the probability of child marriage. In contrast, in Africa, floods tend to increase crop yields, decreasing the incidence of child marriage. In Vietnam, Trinh and Zhang (2020) also find that adverse shocks to a household's income may lead to an increased probability of a girl getting married early as parents use the bride price to cope.

2.2 The notion of purity and women's sexuality, gender and cultural norms

According to sociological theory, in patriarchal societies, honor and status of families is dependent on the 'purity' of their female members (Kandiyoti,1988). In such societies the 'purity' of a woman is dependent on her social and sexual behavior, where a 'pure' woman would be one that abstains from sexual relations prior to marriage. Therefore, there is this perception that early marriage can protect the girl child against events that could compromise her purity and therefore her eligibility to get married later on in life (World Vision ,2013). In Ethiopia, 56.9% of male respondents and 40.1% of female respondents agreed that marrying girls' young could help in the prevention of sexual violence and assault (Kok et. al.,2023)

Building on the concept of 'purity,' Wahhaj (2018) develops a model to explain early marriage patterns worldwide. In this model, a high-quality bride is defined as one who abstains from sexual activity before marriage, while a low-quality bride does not. However, such information is not easily accessible to the groom. Therefore, the model assumes asymmetric information regarding the quality of women in the marriage market and acknowledges that the technology for detecting a bride's quality during the engagement period is imprecise.

Upon engagement, the groom conducts a background check through his social network to determine whether the bride is high or low quality. If the bride is deemed high quality (or if her quality remains undetected), the marriage proceeds, and bride price payments are negotiated

using Nash bargaining, where the outside economic options such as education serve as threat points. However, if the background check reveals the bride to be of low quality, the marriage does not proceed. Consequently, the longer a woman remains on the marriage market, the more it signals to others that she was previously deemed low quality during a failed engagement. This model predicts a negative relationship between a woman's age and her perceived quality in the marriage market. Men prefer to marry younger brides, and women when faced with limited economic opportunities are inclined to accept marriage proposals during their 'prime age' to avoid being perceived as low quality (Buchmann et al.,2021; Ahonsi et al.,2019; UNICEF,2015). This perception perpetuates the practice of child marriage across generations.

Gender norms and inequality also play a crucial role by assigning high value to traditional roles expected of women, such as being a wife and mother responsible for household duties (Petroni et al.,2017). These gender norms often work to the disadvantage of girls and women, as women are more frequently affected by childbirth and child care more often than men (Wodon et al.,2017). The use of gender norms has been documented in the literature as an explanation for the decisions parents make, and why it may be difficult for them to change their practice when they believe their current action is what is right (Greene and Stiefvater,2019).

In developed countries such as the United States of America (USA), the linkage between child marriage and economic insecurity and social norms may not be as significant, but is still present, especially in communities with strong cultural and/or family practice in this regard. For example, Koski and Haymann (2018) find that children from migrant families were more likely to marry below the age of 18 in comparison to native born Americans due to the social and religious views of migrant families. Similarly, Wahi et al. (2019) found that one of the main reasons for children choosing to marry early in the USA was linked to cultural and familial beliefs. However, the broad access to public schooling and compulsory schooling laws in the USA serves to lessen child marriage outcomes (Jiang and Lansford, 2023; Koski and Haymann,2018).

2.3 Lack of Legal Structures

A significant number of Americans associate the practice of child marriage with traditions and cultural norms prevalent in developing countries, assuming it is not a prevalent issue in the USA (Jiang and Lansford, 2023). Yet, 41 states in America still legally permit the marriage of children below the age of 18 (Equality Now, 2023; Reiss, 2021) and a study by Reiss (2021) found that approximately 297,033 children (below the age of 18) were legally married in the USA between the years 2000 and 2008[3]. However, this number most probably underestimates the actual figures as some states don't track this data or make it readily available (Reiss,2021).

Many countries lack effective legal protection to protect young girls against child marriage. It is either the case that there are no legal structures in place or there is a lack of enforcement of these regulations when they exist (Jiang and Lansford, 2023). Arthur et al (2017) conducted an analysis of the legislation concerning child marriage in 191 countries. Their findings show that globally, 23 of the 191 countries permit girls to marry below the age of 18, and when considering exceptions to civil law due to customary or religious law, 30 out of 191 countries allow girls to marry below the age of 18. The regional variation of these countries considering exceptions to the law due to customary law and religious practice varies. The authors find that the Middle East and North Africa tend to have the highest percentage of countries that allow customary and religious exceptions at 41%, followed by South Asia (33%), Sub-Saharan Africa (26%) and East Asia (23%).

Though drivers of child marriage may differ between developed and developing countries, previous research has shown that, irrespective of location, there is an increased probability that girls who marry below the age of 18 have fewer years of education than those who marry later on (Wahi et al., 2019) and lower expected earnings in adulthood (Wodon et al.,2017).

[3] The Uniform marriage and Divorce Act in the United States sets the minimum age of marriage as 18. However, 16 and 17-year-olds are still allowed to wed with parental or judicial permission (Uniform and Divorce Act,1971).

2.4 The Zambian Context

Zambia operates under a dual legal system, allowing both customary and statutory marriages to coexist. On the 26th December 2023, the Parliament of Zambia amended the Marriage Act to set the minimum age of marriage to 18 for all types of marriages, including those conducted under customary law (Government of Zambia Parliament, 2023), thereby making all marriages under the age of 18 illegal.

Prior to the amendment, the legal and regulatory framework in Zambia was inconsistent with defining the minimum age of marriage. While the National Gender Policy 2016-2021 defined child marriage as the marriage of children below the age of 18, the Marriage Act contradicted this (Ministry of Gender, 2015). Under the previous Act, statutory marriage regulations mandated that individuals must be at least 21 years old to marry, providing an exception for children aged 16 to marry if they had parental or judicial consent (Maswikwa et al.,2015).

On the other hand, under customary law, marriage had no specified minimum age for women to consent to marriage. Instead, the defining factor of whether a child was ready for marriage or not was not related to their age but rather, was based on an individual's development and achievement (Ministry of Gender, 2015). In Zambia, puberty, completion of traditional initiation rites, sexual debut, withdrawal or completion of school, employment and the ability to care for others were all considered as indication that a child has entered adulthood (UNICEF,2015). It was also often the case that a large majority of Zambians in rural areas were not aware of the statutory laws[4] in place relating to child marriage, adhering to customary law as a result (Tembo and Muleaga,2008). This divergence between the two legal systems created a complex scenario,

[4] In addition to the Marriage Act, additional laws were in place with the aim at reducing the incidence of child marriage in Zambia. For instance, the Education Act of 2011 stipulated that the marriage of a student or taking a child out of school to be married is illegal (Ministry of Gender, 2015). The Juvenile Act also criminalized the marriage of those aged 16 and below, though this therefore implied that those above 16 can be married, agreeing with the exception in the Marriage Act that those aged 16 and 20 can marry with parental consent (Ministry of Gender, 2015).

making it difficult to tackle the deeply rooted societal norms and practices that contribute to child marriage.

The case of economic insecurity and child marriage is evident in Zambia, where poverty significantly contributes to the incidence of child marriage (UNICEF, 2015; Kok et al., 2023). In a qualitative study conducted by UNICEF (2015) across six districts in Zambia, it was discovered that, in many instances, girls themselves were decision-makers in choosing to get married[5]. These children often perceived marriage as a protective strategy to escape impoverished circumstances (UNICEF,2015). Specifically, those from low-income backgrounds, not enrolled in school, pregnant in teen years, orphans, and children with no adult supervision or support were prone to early marriage. Similarly, in Kenya, Ethiopia, Indonesia and Zambia, lobola payments were also found to be a motivation to marry girls early to ease financial burdens or pay debt (Kok et al.,2023).

Limited research has been conducted to assess the impact that teenage pregnancy has on child marriage in Zambia. In certain instances, girls in Zambia are encouraged to marry the men who impregnate them to avoid disgracing their families (Kok et al.,2022; Kok et al., 2023). Menon et al. (2018) explored the correlation between teenage pregnancy and child marriage in Zambia's Eastern Province. The study was conducted in selected rural wards in Petauke, Chadiza and Katete, using a mixed-method design. The quantitative results from this paper highlight that from the girls that got married as children, 59% of them had a teen pregnancy in the same year that they got married. From the interviews conducted, the authors posit that it is likely that pregnancy was the reason for the marriage.

Using data from the 2013 ZDHS, a study by Mulenga et al. (2018) analyses the factors driving child marriage and fertility in Zambia. The authors find that age of sexual debut is a significant contributor to child marriage in Zambia. In urban areas, women who had sex before the age of 16 had 323% higher odds of getting married before the age of 18. Contrary to the paper by Menon et al. (2018), they find that pregnancy does not often lead to marriage in Zambia. Their results

[5] Community focus groups were organized of 6-10 participants to include married and unmarried boys and girls aged 13-17 years, married young adults aged 18-24 years and parents.

show that girls who lived in rural and urban areas and conceived before marriage had 34% and 36% lower odds of getting married below the age of 18, respectively. Additionally, those that gave birth before marriage were 88% and 87% less likely to get married below the age of 18. The authors attribute these findings to the stigma associated with having children outside of marriage in Zambia, as men tend to avoid marrying women who have had children outside wedlock. This aligns with the purity model by Wahhaj (2018), which in this case would suggest that women with children outside of wedlock may be perceived as 'low quality'. These contrasting results with Menon et al. (2018) allude to the fact that the relationship between child marriage and pregnancy may vary across districts and communities.

SECTION 3: FROM THE CLASSROOM TO MARRIAGE

Similar to many causal relationships, investigating the impact of child marriage on educational attainment can present significant challenges due to the presence of confounding factors such as innate ability, parents' education, cultural traditions, and potential reverse causality that may influence the outcome. It is difficult to determine whether being a child bride leads to reduced educational attainment due to girls leaving school to assume their marital duties, or whether it is the lack of quality education that drives girls to get married early. In the absence of a reasonable strategy to confirm the causal direction, any associations between child marriage and education should be treated as such, as opposed to being causal.

The literature on educational attainment and child marriage generally confirms that girls marrying at an early age tend to achieve fewer years of schooling compared to those who marry later in life (Field and Ambrus, 2008; Delprato et al.,2015; Wodon et al.,2016). Conducting a study on child marriage and education in Uganda, Wodon et al. (2016) utilise a combination of qualitative and quantitative research to establish a causal relationship between child marriage and secondary enrollment and completion. The authors find that while some communities may equally support the education of boys and girls, other communities preferred educating boys, viewing the education of girls as a waste of resources because they often leave school to marry. To address

potential endogeneity issues, where being a child bride is correlated with the error term, the authors incorporate instrumental variables at the Primary Sampling Unit (PSU) level. They utilize "leave-out-means"[6] to construct instruments, employing both present and past leave-out means of the share of child brides for each age group between 11 and 17. Their results show that girls marrying at the age of 17 are 12.4% less likely to complete secondary school compared to those marrying at 18. Moreover, they observe that this negative effect becomes more pronounced with a decrease in age, with girls marrying at the age of 13 being 23.1% less likely to complete secondary school.

In many communities in Bangladesh, girls are typically introduced to the marriage market at the onset of puberty. Field and Ambrus (2008) explore the consequences of child marriage on educational attainment in Bangladesh by using the natural variation in the timing of girls' first menstruation between the ages of 11-16 as instruments on the age of the first marriage. Their findings reveal that delaying marriage by one year between ages 11 and 16 positively influences educational attainment. Specifically, there is an average increase of 0.22 years in educational attainment, and an additional year of delay enhances female adult literacy[7] by 5.6 percent.

Similar to Field and Ambrus (2008), Sunder (2019) examines the causal impact of early marriage on education, literacy, and employment, using the age of menarche as the instrumental variable. The author finds that by delaying marriage by one year, women in Uganda are more likely to attain 0.5 to 0.77 additional years of education.

In contrast to the previous four papers discussed, Delprato et al. (2015) conducted a multi-country study, using 36 countries from both Sub-Saharan Africa and South West Asia to establish the impact of child marriage on schooling outcomes. To account for endogeneity the authors employ

[6] The leave-out mean represents the average of respondents married at a specific age within the PSU level where the respondent resides, excluding the particular individual.

[7] Adult literacy is defined as the respondent's ability to read and write on a scale of 1-3, with 1 or 2 being considered as literate.

three instrumental variables: the average age of marriage in the community using the contemporaneous cohort, the proportion of non-premarital sex, and the total fertility rate.

Table 1: Past Literature using Instruments to estimate causal impact of child marriage on education

Author and Year	*Location*	*Instrument Used*	*Sample Size*	*Result*
Wodon et.al (2016)	Uganda	Present and Past Share of Child Brides in the Primary Sampling Unit (PSU)	2,565 ever-married women aged 25-34 years.	Being married at ages 17 and 13 decreases the probability of completing secondary schooling by 12.4% and 23.1%, respectively.
Field and Ambrus (2008)	Bangladesh	Age of Menarche	2,102 ever-married women aged 25-44 years.	A delay in marriage by 1 year increases educational attainment by 0.22 years.
Sunder (2019)	Uganda	Age of Menarche[8]	4,930 women.	A delay in marriage by 1 year increases educational attainment by 0.5-0.77 years.
Delprato et al. (2015)	Sub-Saharan Africa (SSA) and South West Asia (SWA)	Past average age of marriage in a community, share of non-premarital sex[9] and fertility rate.	150 314 women in SSA & 50 777 women in SWA aged 20-29 years who first married between the ages of 11-17 years.	A delay in marriage by 1 year in Sub- Saharan Africa increases educational attainment by 0.5years.

Source: Compiled by author

In their study of the effect of child marriage on schooling in Sub-Saharan Africa and South West Asia, Delprato et al. (2015) show that by delaying child marriage by one year, girls may experience

[8] Unlike DHS Data for Bangladesh and Uganda, the ZDHS 2018 does not include age of menarche to allow for replication of studies conducted by Field and Ambrus (2008) and Sunder (2019).

[9] Non-premarital sex measures the share of girls in the community that did not engage in premarital sex. This variable acts as a proxy for the values that a community places on a girl child's virginity and 'purity'.

at least an additional half a year of schooling in Sub-Saharan Africa. In South West Asia, the effect is smaller and girls only experience one-third of a year of additional schooling. However, caution is warranted in interpreting these results as the instruments fail to pass the overidentification tests. Specifically, the use of fertility as an instrumental variable raises questions as the fertility rate in a woman's community may also impact a woman's educational outcomes.

SECTION 4: DATA

The data for this dissertation comes from the Zambia Demographic Health Survey (ZDHS), which utilised a stratified two-stage sampling design. In the first stage, 545 enumeration areas (EAs) were selected. On average, each cluster contained 133 households. Systematic sampling was then used to select 25 households per cluster, resulting in a total sample of 13,625 households. This sample is representative at the national, provincial, urban, and rural levels. Eligible participants included all women aged 15-49 and all men aged 15-59 who were either permanent residents or had stayed in the selected households the night before the survey. The survey successfully interviewed 13,683 women and 12,132 men.

To analyze the impact of early marriage on women's education, the combined data from both the women's and men's survey is utilised, focusing on couples who reported that they were married or cohabiting and who both completed individual interviews at the time of the survey[10]. The questionnaire for both men and women included identical questions on background characteristics, reproduction, contraception, marriage and sexual activity, fertility preferences and employment and gender roles. Survey weights[11] are used to run estimations.

Two outcome variables are used in this dissertation: the number of years of education completed and a dummy variable which indicates whether the respondent had completed secondary schooling or not. In Zambia, 1 to 7 years of education constitutes as primary education, 8-9 years

[10] Previous studies using similar data have focused on the women's dataset only. However, conducting estimations with variables from the men's dataset in this dissertation shows that certain characteristics and beliefs of the respondents' husbands are correlated with women being child brides.

[11] The DHS recommends the use of the men's individual weights for everyone when using the couple's data set.

is lower secondary, 10-12 years is upper secondary and 13-19 years is tertiary education. Timing of school completion is not included in the data and the data does not indicate whether respondents are still attending school or not. However, the expected years of education a child is expected to complete by age 18 in Zambia is 8.8 years (UNESCO, Nd). Therefore, using this statistic as a guideline we restrict the sample to women aged 22 years to 44 years, allowing for the possibility that individuals might take as much as 3 more years to complete secondary schooling[12].

4.1 Free Basic Education Policy

In 2002, the Ministry of Education in Zambia introduced the Free Basic Education Policy in public primary schools, with an aim to increase enrollment and completion rates. Following this policy, the Ministry of Education implemented a comprehensive Education Strategic Plan for 2003-2007, which included substantial investments in Zambia's education system. This plan led to the widespread construction of new schools and classrooms, and an increase in the employment of teachers. By 2010 net enrollment rate increased to 84% for primary school from 74.8% in 2002 (JICA,2012).

To account for the effect that the broad implementation of free schooling would have on girl's education and her probability of being a child bride[13], a variable is created to this effect. The Free Basic Education variable is calculated by measuring the share of years a woman was exposed to free basic education in Zambia. Given that the starting age for primary school in Zambia is 7 years, a categorical variable is created to measure how many years out of the 7 years in primary school were completed under the policy regime[14]. For instance, girls born from 1995 onwards had a full 7/7 years of access to free education since they would have entered primary school in 2002, whilst girls born in 1993 would have 5/7 years of free education. Those born in 1988 or earlier would have 0 years of access to free education. While the inclusion of the free education policy variable

[12] To be clear, the assumption is that an individual aged 22 years or older who has not completed secondary schooling is very unlikely to return to school to do so.
[13] Koski et al. (2018) found that the removal of basic tuition fees in Ethiopia and Rwanda reduced child marriage by 10-15 percentage points.
[14] Grade repetition cannot be accounted for as the ZDHS does not ask respondents about any grades they repeated.

may help to account for access to educational resources, it is important to note that access to free education does not equate to quality of education.

4.2 Child Brides

Given the legal discrepancy in defining child marriage in Zambia highlighted in section 2.4, two dummy variables are constructed to define being a child bride. Using the responses about the respondents age of first marriage from the survey, the first dummy variable takes a value of 1 for those women who married below the age of 18 and a value of 0 for those women who married at the age of 18 and above. The second variable takes a value of 1 for those married below the age of 21 and a value of 0 for those women married at the age of 21 and above. Given the ambiguity in the legal frameworks, applying different thresholds for being considered a child bride allows us to navigate this. From the couple's data set, 15% of women were married more than once and of these women, 57% were child brides. Therefore, to ensure child brides are still with the partner they first married we limit the sample to those women that have only been married once, providing a sample of 3604 couples with non-missing values[15].

Prior studies have found that the consequences of being a child bride are greater for those that marry significantly earlier (Erilkar,2013; Nguyen and Wodon,2014; Wodon et al, 2015). To assess whether a similar impact can be shown with educational outcomes, different age-of-marriage bands are constructed for those who married at ages 10-14,15-17, 18-21, 22-25, and 26-29. The analysis will first consider outcomes for child brides (married before 18 or 21), and then move to a more granular analysis by considering these finer age cohorts.

Figure 1 shows the distribution of age of first marriage for women currently aged 22-44. The distribution highlights that the average age of marriage is 19 years for the sample, with approximately 45% reporting that they married below the age of 18, and about 75% reporting that they married below the age of 21.

[15] This dissertation looks to understand the effect of being married early versus late on education, rather than the effect of being married versus not being married. Thus, the sample is limited to married women only.

Figure 1:Distribution of Age of first marriage for women currently aged 22-44

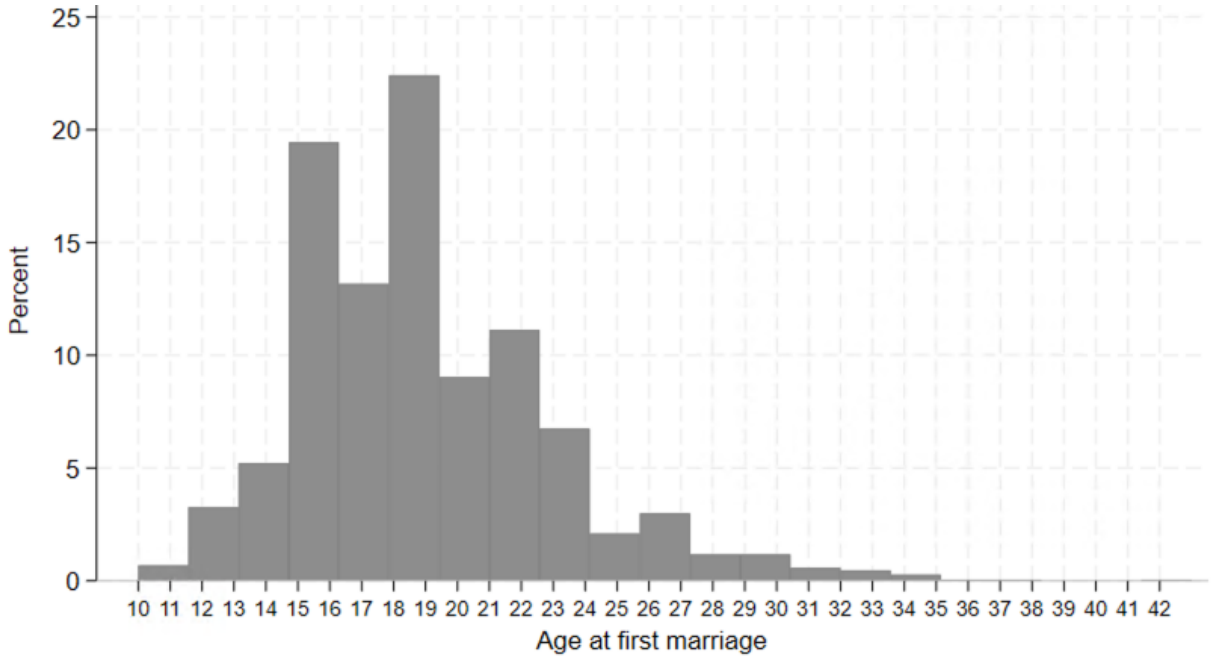


Table 2 below provides summary descriptives for the sample as a whole, and then a breakdown for child brides versus non-child brides, using the two different age thresholds. We discuss the summary statistics first focusing on differences in educational outcomes before considering differences in the other variables.

Table 2: Summary Statistics for child brides and non-child brides

	Full Sample	Married<18	Married >=18		Married<21	Married> =21	
Years of education	6.583 (3.896)	5.098 (3.156)	7.679 (4.026)	***	5.798 (3.413)	8.840 (4.299)	***
Completed Secondary	0.134 (0.340)	0.027 (0.162)	0.213 (0.409)	***	0.058 (0.234)	0.352 (0.478)	***
Fraction of time exposed to Free Education Policy	0.267 (0.366)	0.274 (0.370)	0.262 (0.363)	***	0.286 (0.376)	0.214 (0.331)	***
Pregnant before marriage	0.236 (0.424)	0.063 (0.243)	0.363 (0.481)	***	0.136 (0.343)	0.523 (0.500)	***
Husbands current age	36.991 (7.470)	37.371 (7.264)	36.712 (7.608)	*	36.844 (7.428)	37.414 (7.577)	***
Husband has no education	194 (5.4%)	112 (7.3%)	82 (4.0%)	***	168 (6.3%)	26 (2.8%)	***
Husband completed Primary	1,521 (42.2%)	806 (52.7%)	715 (34.5%)	***	1,266 (47.3%)	255 (27.4%)	***
Husband completed Secondary	1,485 (41.2%)	553 (36.1%)	932 (44.9%)	***	1,085 (40.6%)	400 (43.0%)	***
Husband completed Tertiary	404 (11.2%)	59 (3.9%)	345 (16.6%)	***	155 (5.8%)	249 (26.8%)	***
Rural	0.660 (0.474)	0.745 (0.436)	0.596 (0.491)	***	0.718 (0.450)	0.490 (0.500)	***
Number of survey responses husband and wife differed on[16]	0.477 (0.240)	0.480 (0.248)	0.475 (0.235)		0.482 (0.247)	0.463 (0.219)	***
Difference in education between husband and wife	0.976 (3.214)	1.265 (3.040)	0.762 (3.321)	***	1.085 (3.147)	0.662 (3.382)	***
Age of first sexual encounter	16.514(2.565)	15.373(1.573)	17.356(2.817)	***	15.990(1.946)	18.022(3.398)	***
Community average of non-premarital sex	0.395(0.200)	0.440(0.195)	0.362(0.197)	***	0.419(0.197)	0.326(0.192)	***
Number of Observations	3,604	1,530 (42.5%)	2,074 (57.5%)		2,674 (74.2%)	930 (25.8%)	

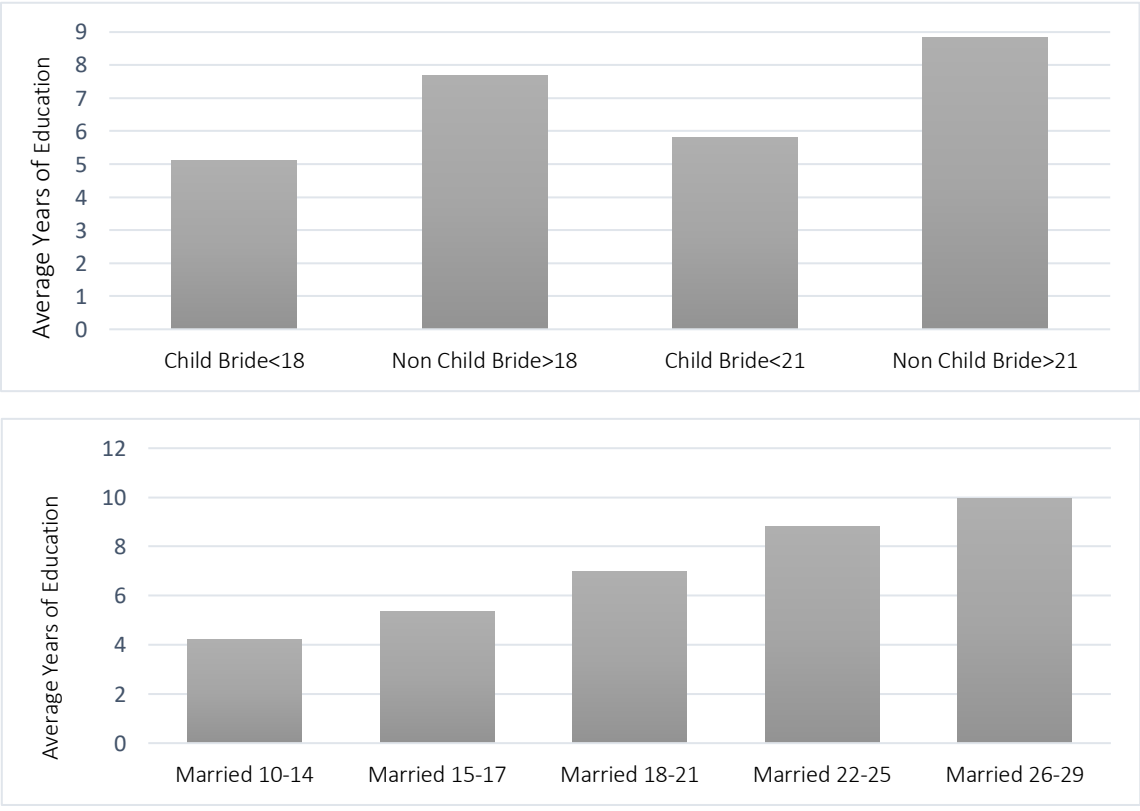
Note: Wilcoxon Rank-sum Tests conducted to test the null hypothesis between the child brides and non-child brides
**** p<0.01, ** p<0.05, * p<0.1*

[16] A variable was created to measure the number of survey responses where husband and wife differed on. When interviewed, women were asked about the age and education level of their partners and in some instances, these responses differed from those their husbands gave when interviewed. Both husbands and wives were also asked about their views on whether wives could contribute to large purchases or whether abuse was ever justified. The purpose of creating this variable is to capture the extent of discrepancies in responses, especially regarding decision-making and views on abuse, which may reflect a power imbalance within the couple.

4.3 Child Brides and educational attainment

Table 2 above provides summary statistics for child brides and non-child brides using the two constructed child marriage dummy variables. The statistics show that on average, girls that married young have fewer years of education compared to those girls that married at a later age. Women married below the age of 18 had on average 5 years of education, compared to those married above the age of 18, who had on average 7.7 years of education. In relation to secondary completion, approximately 2.7% of child brides married below the age of 18 had completed secondary in comparison to the 21% of women who married above 18. Figure 2 below confirms this for years of education. Additionally, the bar chart below shows that for the different age of marriage bands, the later women get married, the more education in years they attain on average.

Figure 2: Average Years of Education



For women married below the age of 21, the average years of education completed is 5.8 years, compared to those married above 21 at 8.8 years. When looking at secondary completion in the summary statistics 35% of women who married after 21 completed secondary in comparison to the 5.8% of women who married below the age of 21.

4.3 Differences in other descriptives for child versus non-child brides

Additional controls are included as detailed in the summary statistics table[17]. To address the potential correlation between child marriage and teenage pregnancy[18], which could impact educational attainment, a dummy variable is introduced, signaling if a girl had a child either before or at the same age as her marriage. Interestingly, there appears to be a significant shift in the number of pregnancies before marriage among women aged 18 and older. On average, 36% of women who married above the age of 18 were pregnant before they got married compared to the 6% of women who married below the age of 18. We also observe that child brides tend to have husbands who are less educated and are also most likely to reside in rural areas than urban after they are married.

Table 3 reproduces the summary statistics from Table 2 disaggregated by age band, and tests whether the means for those married between age 10-14 have significantly different mean outcomes than those married later. The statistics show that girls married between 10-14 have statistically lower education outcomes compared to those married later in each marriage age band. As the age of marriage band increases, education years increase. The same is true for secondary school completion, for those married 18-21, only 13% complete secondary, compared to 35% for those married 22-25. When looking at the fraction of time exposed to free education

[17] Despite the potential advantages of including information on the living conditions of girls before marriage, such data is unavailable in the ZDHS. However, husbands' characteristics data such as education level completed from men's responses are included to account for influence that the husband might have on the wife. It should also be noted that the inclusion of residence is not a predicator of becoming a child bride, but may be an ex-post correlation as to where child brides end up given that this is data on where the respondent currently resides.

[18] This only includes pregnancies where a woman carried full term.

policy, 24% of those married between 10-14 benefited from the policy compared to 3% of those married between the ages of 26-29

Table 3: Statistics by age of marriage bands

	Married 10-14	Married 15-17		Married 18-21		Married 22-25		Married 26-29	
Years of education	4.226 (3.105)	5.345 (3.128)	***	6.976 (3.599)	***	8.825 (4.306)	***	9.964 (4.530)	***
Completed Secondary	0.018 (0.132)	0.029 (0.169)		0.129 (0.335)	***	0.348 (0.477)	***	0.464 (0.500)	***
Fraction of time exposed to Free Education Policy	0.248 (0.354)	0.282 (0.374)	***	0.310 (0.385)	***	0.241 (0.333)	***	0.028 (0.080)	***
Pregnant before marriage	0.021 (0.143)	0.075 (0.263)	***	0.268 (0.443)	***	0.511 (0.500)	***	0.578 (0.495)	***
current age	38.659 (7.082)	37.007 (7.276)	***	36.091 (7.576)	***	36.878 (7.649)		39.265 (6.799)	***
educational level									
Husband has no education	30 (8.9%)	82 (6.9%)	***	63 (4.6%)	***	12 (2.5%)	***	3 (1.8%)	***
Husband completed Primary	193 (57.3%)	613 (51.4%)	***	527 (38.4%)	***	130 (27.4%)	***	42 (25.3%)	***
Husband completed Secondary	107 (31.8%)	446 (37.4%)	***	644 (47.0%)	***	210 (44.3%)	***	55 (33.1%)	***
Husband completed Tertiary	7 (2.1%)	52 (4.4%)	***	137 (10.0%)	***	122 (25.7%)	***	66 (39.8%)	***
Rural	0.748 (0.435)	0.744 (0.436)		0.668 (0.471)	***	0.487 (0.500)	***	0.410 (0.493)	***
Number of survey responses husband and wife differed on	0.485 (0.250)	0.478 (0.248)		0.487 (0.246)		0.452 (0.212)	**	0.438 (0.195)	**
Difference in education between husband and wife	1.552 (3.123)	1.184 (3.012)	***	0.800 (3.230)	***	0.616 (3.585)	***	0.633 (3.036)	***
Age of first sexual encounter	14.228(1.501)	15.696(1.436)	***	16.929(2.187)	***	18.072(3.224)	***	18.566(3.999)	***
Community average of non-premarital sex	0.482(0.184)	0.429(0.196)	***	0.382(0.199)	***	0.335(0.193)	***	0.294(0.173)	***
Number of Observations	337 (9.4%)	1,193 (33.1%)		1,371 (38.0%)		474 (13.2%)		166 (4.6%)	

Note: Wilcoxon Rank-sum Tests conducted to test the null hypothesis between women married between 10-14 and other age of marriage bands.
*** p<0.01, ** p<0.05, * p<0.1

SECTION:5 THE ECONOMICS OF CHLID MARRIAGE

5.1 Econometric Model of Child Marriage

The theoretical model guiding the econometric specification in this paper draws on the model on child marriage, referenced by Wahhaj (2018) above. The model assumes that in a community that places great importance on the purity of a girl child, as well as a community that has limited opportunities and resources, child marriage will prevail. The use of cross-sectional data limits the full estimation of the model, therefore, this dissertation opts to exploit the empirical implications of the model instead.

The specification for the OLS estimation is as follows:

$$E_{ij} = \gamma_0 + \gamma_1 C_{ij} + \gamma_2 X_{ij} + \gamma_3 W_j + \zeta_{ij} \qquad (1)$$

The dependent variable E_{ij} is the outcome variable years of education or secondary school completion of a woman in household i in community j. C_{ij} represents the dummy variables for whether the woman is a child bride or not. X_{ij} contains individual characteristics such as current place of residence and whether the individual was pregnant before marriage. W_j includes the husband's characteristics and differences in spousal outcomes covariates.

As discussed in Section 3, establishing a causal relationship between child marriage and education is complex. While ordinary least squares (OLS) can provide consistent estimates, it may introduce bias due to omitted variables like innate ability, parental background and cultural and societal norms in the error term. The issue of reverse causality may influence the outcome as well. Girls may leave school to get married, reducing their educational attainment or it may be the case that the lack of quality education drives girls to get married early, biasing OLS estimates.

Utilising instrumental variables addresses this issue and helps mitigate such biases. Previous papers (Field and Ambrus,2008; Sunder,2019) develop arguments around the use of age of menarche as an instrument. In many traditional contexts, girls tend to enter marriage shortly after

reaching puberty. A similar approach can be applied using the age of sexual debut in Zambia, where marriage is strongly linked to the understanding of sexuality and age of sexual debut (Ministry of Gender, 2015). Based on self-reported survey responses in the 2013-2014 ZDHS, women on average reported that they had engaged in sexual relations a year before their first marriage in comparison to men who reported that they had engaged in sexual relations up to five years before their first marriage (Ministry of Gender, 2015). Given that information on age of menarche Is not available in the dataset, this dissertation uses the age of sexual debut as an instrument for child marriage[19].

The Two-Stage Model is given by:

$$C_{ij} = \beta_0 + \beta_1 Z_{ij} + \beta_2 X_{ij} + \beta_3 W_j + \varepsilon_{ij} \quad (2)$$

$$E_{ij} = \gamma_0 + \gamma_1 C_{ij} + \gamma_2 X_{ij} + \gamma_3 W_j + \zeta_{ij} \quad (3)$$

Equation 2 shows the first stage and equation 3 is the second stage. Z_{ij} is the instrument age of sexual debut instrumented on child bride C_{ij}.As mentioned above, E_{ij} is the education outcome, X_{ij} contains individual characteristics and W_j includes the husband's characteristics and differences in spousal outcomes covariates.

5.2 Validating sexual debut as an instrumental variable

Age of sexual debut refers to the age at which an individual first engages in sexual activity. In traditional societies pre-marital sex may lead to early marriage due to the social norms that push for marriage following girl's sexual activity. In prior work, Mulenga et al. (2018) found sexual debut to be strong predicator of child marriage in Zambia.

To fulfil the properties of instrumental variables estimation, age of sexual debut must be exogenous and strongly correlated with child marriage. Additionally, age of first sexual debut must

[19] A paper by Saha et al. (2024) used a similar strategy to measure the impact of early marriage of women on the education of their children in Mali.

fulfil the exclusion restriction and have no direct effect on education except through child marriage. Using the specifications described above, table 4 reports the first stage results showing the impact of age of sexual debut on child marriage.

The first stage results of the regression analysis provide important insights into the factors influencing the probability of girls marrying below the age of 18 and 21, as well as the different marriage age groups (10-14, 15-17, 18-21, 22-25 & 26-29) in Zambia. For girls married below the age of 18, a delay in the age of sexual debut decreases the probability of being married under 18 by 0.07. However, when looking at those married below the age of 21, the effect is smaller at 0.05. When assessing the different marriage age bands, the instrument has a similar negative effect for those married between 10-14 and 15-17. However, for those married above 18 the effect is now positive, where age of sexual debut now increases the probability of girls getting married.

Pregnancy before marriage also shows significant negative effects for those married below the age of 18 and age of 21. When looking at the effect across the age of marriage groups, the effect is similar. For girls married between 10-14 and 15-17 being pregnant before marriage decreases the probability of getting married young by 0.12 and 0.29 respectively. Considering that prior studies have identified teen pregnancy as a catalyst for child marriage, we would anticipate the effect to be in the other direction. Interestingly, for those married between 18-21 and above there is a positive association with pregnancy before marriage and getting married. This coincides with the summary statistics above where a large percentage of women 18 and above were pregnant before marriage. This result might be associated with the notion of 'purity' that Wahhaj (2018) models, and may perhaps signify that there is a societal stigma associated with having children outside of wedlock, indicating that women who have children early are less likely to marry and may enter the marriage market at a later age as shown in the descriptive statistics. This trend may indicate the significance that certain communities place on preserving a girl's virginity, thus aligning with the potential motivators identified in previous research on child marriage (Kok et.al.;2023; Wahajj,2018).

Unexpectedly, the exposure to free education variable shows a positive effect with being a child bride married below the age of 21 and married between 15-17 and 18-21. This is in contrast with the findings by Ashraf et al. (2020) in Zambia, which suggest that when costs to education are reduced, parents tend to invest in girls' education to secure a higher bride price later on. Educational attainment of husbands shows varied effects. In comparison to a husband not being educated, completion of secondary and higher education by husbands significantly reduces the likelihood of a women being married between 15-17. The completion of primary education does not show significant effects, suggesting that higher levels of education are more influential.

Table 4: First Stage Results

	Child Bride <18	Child Bride <21	Married between 10-14	Married between 15-17	Married between 18-21	Married between 22-25	Married between 25-29
Fraction of time exposed to Free Education Policy	0.039	0.094***	-0.019	0.058**	0.084***	-0.010	-0.070***
	-1.52	-4.91	-0.014	-0.028	-0.028	-0.017	-0.007
Pregnant before Married	-0.417***	-0.431***	-0.123***	-0.293***	0.0494**	0.194***	0.097***
	(-22.15)	(-20.59)	-0.009	-0.019	-0.024	-0.02	-0.014
Husband completed Primary	-0.075*	-0.035	-0.035	-0.040	0.064	0.022	0.017
	(-2.03)	(-1.26)	-0.030	-0.042	-0.040	-0.019	-0.011
Husband completed Secondary	-0.192***	-0.100***	-0.076**	-0.116***	0.144***	0.057***	0.022*
	(-4.94)	(-3.39)	-0.030	-0.044	-0.042	-0.021	-0.012
Husband completed Higher	-0.257***	-0.269***	-0.077**	-0.180***	0.041	0.153***	0.103***
	(-5.43)	(-6.39)	-0.032	-0.051	-0.054	-0.0393	-0.023
Rural	0.001	0.061***	-0.013	0.014	0.070***	-0.032**	-0.009
	-0.04	-3.39	-0.012	-0.023	-0.022	-0.015	-0.008
Number of survey responses husband and wife differed on	-0.001	0.038	-0.008	0.007	0.063	-0.067***	-0.002
	(-0.02)	-1.25	-0.024	-0.040	-0.040	-0.026	-0.015
Difference in education between husband and wife	0.011***	0.008***	0.005***	0.006**	-0.006*	-0.005**	-0.003**
	-4.18	-3.36	-0.002	-0.003	-0.003	-0.002	-0.001
Age of Sexual Debut	-0.075***	-0.054***	-0.032***	-0.043***	0.030***	0.027***	0.012***
	(-21.40)	(-16.88)	-0.002	-0.003	-0.004	-0.004	-0.002
Constant	1.882***	1.732***	0.721***	1.161***	-0.322***	-0.356***	-0.171***
	-25.92	-27.93	-0.056	-0.076	-0.082	-0.063	-0.043
Number of Observations	3604	3604	3,604	3,604	3,604	3,604	3,604

Notes: Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.3 Limitations

The primary concern with using the age of sexual debut as an instrument is whether it satisfies the exogeneity condition. As previously mentioned, unaccounted parental background information in the error term may introduce bias into the results, especially if it correlates with the instrument. Chae (2013) found that in Burkina Faso, Ghana, Malawi, and Uganda, female orphans had higher odds of experiencing sexual debut earlier than non-orphans. Since the data being used has missing information for orphans, there is a risk that the instrument may be correlated with orphanhood, which challenges the claim of complete exogeneity.

Another concern relates to access to education. It might also be the case that communities with less access to education may lead girls to engage in earlier sexual relations. However, Chae (2013) found that in 4 countries, education had little to explanatory power with girls' risk of premarital sex. Nevertheless, to account for any possibility that access to education might affect earlier sexual relations, a variable for exposure to free basic education is included in regression estimates as an indicator for access to free education.

Lastly, there is the risk of measurement error when using age of first sexual debut due to recall bias or misreporting. Social norms around premarital sex may cause respondents to adjust their reported age of sexual debut to align with the timing of their marriage. To mitigate the potential impact of these limitations on the IV results, additional estimations are conducted in the robustness section using alternative instruments, namely the community share of non-premarital sex and community share of past child brides.

SECTION 6: REGRESION RESULTS

Table 5 presents the OLS results on the impact of child marriage on years of education. Column 1 indicates that marrying below the age of 18 is associated with a decrease of 0.52 years of education. Column 2 reflects a similar trend for women married before the age of 21. Column 3 considers disaggregated age cohorts, revealing that in comparison to women who married at age 30 or older, marrying between the ages of 10-14 is associated with a 1.12 decrease in years of education, while marrying between the ages of 15-17 results in a 0.76 year decrease. While the results are only statistically significant for the first two marriage age bands, we observe a smaller negative effect on the other marriage bands suggesting that the later women delay marriage, the smaller the impact on their education.

Columns 4-6 consider the effect of child marriage on the likelihood that a woman completes her secondary schooling. In columns 4 and 5, being married before the age of 18 and 21 is associated with a decrease in the probability of completing secondary school by 6 and 15.5 percentage points respectively. For the marriage age bands, compared to women who married after 30, those who married between 10-14 experienced a 12.5 percentage point decrease in the probability of completing secondary school, while women marrying between 15-17 saw a decrease of 15 percentage points.

The exposure to the Free Education Policy enacted in Zambia has a positive and significant effect on the number of years of education attained. However, this variable is not significant when secondary school completion is the outcome. This finding indicates that access to free primary education does not necessarily guarantee that children will enrol in and complete secondary schooling.

Table 5: OLS results

	Yrs. Of Education	Yrs. Of Education	Yrs. Of Education	Completed Secondary	Completed Secondary	Completed Secondary
	1	2	3	4	5	6
Child Bride <18	-0.524***			-0.065***		
	-0.068			-0.011		
Child Bride <21		-0.556***			-0.155***	
		-0.078			-0.0176	
Married between 10-14			-1.117***			-0.125**
			-0.274			-0.0567
Married between 15-17			-0.761***			-0.151***
			-0.26			-0.056
Married between 18-21			-0.386			-0.109**
			-0.254			-0.0555
Married between 22-25			-0.092			0.016
			-0.256			-0.056
Married between 26-29			0.197			0.020
			-0.272			-0.061
Fraction of time exposed to Free Education Policy						
	0.334***	0.364***	0.387***	-0.012	0.000	0.003
	-0.085	-0.086	-0.087	-0.014	-0.014	-0.014
Pregnant before Married						
	0.096	0.068	-0.017	-0.030**	-0.067***	-0.060***
	-0.075	-0.076	-0.078	-0.013	-0.014	-0.015
Husband completed Primary						
	4.478***	4.502***	4.462***	0.134***	0.131***	0.133***
	-0.089	-0.088	-0.090	-0.015	-0.015	-0.016
Husband completed Secondary						
	7.717***	7.775***	7.678***	0.245***	0.238***	0.242***
	-0.086	-0.084	-0.087	-0.018	-0.018	-0.018
Husband completed Higher						
	12.74***	12.75***	12.60***	0.796***	0.760***	0.766***
	-0.127	-0.127	-0.13	-0.028	-0.029	-0.029
Rural	-0.883***	-0.854***	-0.853***	-0.067***	-0.056***	-0.057***
	-0.071	-0.072	-0.071	-0.012	-0.011	-0.011
Number of survey responses husband and wife differed on						
	-0.694***	-0.678***	-0.668***	-0.0546**	-0.047**	-0.045**
	-0.127	-0.128	-0.127	-0.022	-0.022	-0.022

Difference in education between husband and wife						
	-0.819***	-0.821***	-0.814***	-0.039***	-0.038***	-0.039***
	-0.011	-0.011	-0.011	-0.002	-0.002	-0.002
Constant	1.941***	2.067***	2.237***	0.026	0.114***	0.095*
	-0.122	-0.127	-0.262	-0.022	-0.026	-0.057
Observations	3,604	3,604	3,604	3,604	3,604	3,604
R-squared	0.839	0.838	0.841	0.465	0.487	0.48

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6 shows the results from the IV estimations, using age of sexual debut as the IV. When looking at years of education as the outcome, being a child bride has significantly worse outcomes on educational attainment. Being married below the age of 18 is associated with a decrease in years of education by 1.4 years, whereas being married below the age of 21 decreases years of education by 1.9 years. Women married between the ages of 10-14 and 15-17 experience worse outcomes in terms of educational attainment compared to those married after the age of 30. Specifically, the results show that getting married between age 10-14 has a negative impact on girls' education by 1.1 years, whereas getting married between 15-17 reduces years of education by 0.38.

Turning to secondary schooling completion in columns 4,5 and 6, the co-efficients are larger than the OLS results. The results for secondary school completion (columns 4, 5, and 6) show a clear negative relationship between early marriage and the likelihood of completing secondary education. Marrying before the age of 18 reduces the probability of completing secondary school by 21 percentage points, while marrying before 21 decreases it by 29.1 percentage points. In comparison to women that marry after the age of 30, women that marry between the ages of 10-14 decrease their probability of completing secondary by 15.2 percentage points. Similarly, those married between 15-17 face an 8.87 percentage point decrease in the probability of completing secondary.

Table 6: IV estimation results

	Yrs. Of Education	Yrs. Of Education	Yrs. Of Education	Completed Secondary	Completed Secondary	Completed Secondary
	1	2	3	4	5	6
Child Bride <18	-1.393***			-0.210***		
	-0.172			-0.0346		
Child Bride <21		-1.927***			-0.291***	
		-0.252			-0.0455	
Married between 10-14			-1.124***			-0.152**
			-0.292			-0.061
Married between 15-17			-0.376***			-0.089***
			-0.138			-0.0304
Married between 18-21			-0.125			-0.0442**
			-0.0904			-0.02
Married between 22-25			-0.0174			-0.000369
			-0.068			-0.0151
Married between 26-29			0.0445			0.00319
			-0.0582			-0.013
Fraction of time exposed to Free Education Policy	0.388***	0.516***	0.388***	-0.0033	0.016	0.00603
	-0.0877	-0.0912	-0.0864	-0.0144	-0.0152	-0.0143
Pregnant before Married	-0.219**	-0.470***	-0.0217	-0.0830***	-0.121***	-0.0660***
	-0.0953	-0.127	-0.0784	-0.018	-0.022	-0.0148
Husband completed Primary	4.378***	4.415***	4.460***	0.117***	0.122***	0.132***
	-0.102	-0.1	-0.0896	-0.0168	-0.0163	-0.0155
Husband completed Secondary	7.464***	7.540***	7.674***	0.203***	0.215***	0.240***
	-0.109	-0.103	-0.0869	-0.0213	-0.0199	-0.0182
Husband completed Higher	12.30***	12.14***	12.59***	0.723***	0.699***	0.761***
	-0.16	-0.176	-0.13	-0.034	-0.0364	-0.0292
Rural	-0.851***	-0.734***	-0.853***	-0.0617***	-0.0442***	-0.0555***

	-0.0735	-0.0783	-0.0712	-0.0119	-0.0119	-0.0114
Number of survey responses husband and wife differed on	-0.655***	-0.580***	-0.666***	-0.0481**	-0.0368	-0.0440**
	-0.132	-0.134	-0.127	-0.0223	-0.0226	-0.0217
Difference in education between husband and wife	-0.799***	-0.798***	-0.813***	-0.0361***	-0.0360***	-0.0384***
	-0.012	-0.012	-0.011	-0.00211	-0.00204	-0.00199
Constant	2.513***	3.229***	2.230***	0.122***	0.230***	0.118*
	-0.168	-0.245	-0.277	-0.0318	-0.0447	-0.0606
Observations	3,604	3,604	3,604	3,604	3,604	3,604
R-squared	0.829	0.82	0.841	0.429	0.464	0.48
Exogeneity Test[20]	33.0(0.00)	43.8(0.00)	5.9(0.31)	37.6(0.00)	18.3(0.00)	40.9(0.00)
F-test	635.14	384.46	7990.21	622	441.41	7990.21

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

SECTION 7: ROBUSTNESS

In this section, a sensitivity analysis is conducted to assess the IV results from the previous section. Murray (2006) suggests that where formal identification tests are not plausible, the use of alternative instruments is recommended to validate the credibility of instrumental variables. An alternative IV approach is to use the community share of women who self-reported that they have not engaged in premarital sex (Delprato et al.,2015; Delprato et al.,2017), and the community past share of child brides (Delprato et al.,2015; Delprato et al.,2017; Wodon et al., 2016) as instruments for child marriage. These instruments, drawing from papers by Delprato et al. (2015) and Delprato et al. (2017) provide a validity check for the results presented above.

[20] To confirm validity of age of sexual debut as an instrument, additional tests are run. First, the Durbin-Wu-Hausman test is conducted and a p-value of 0.00 is attained for all six models. This result confirms that child marriage is endogenous, thereby validating the use of instrumental variables. Next, the F test for all six models is well above the rule of thumb 10, confirming the strength of the instrument.

The intuition behind these instruments is rooted in community-level factors, which may reflect peer-group influences. The proportion of women who did not engage in premarital sex may reflect the community's perception of the importance of a girl's virginity, while the past share of child brides may capture the influence the community has over a girl's decision to marry due to the social norms they may hold. To address concerns about Manski's reflection problem (Manski,1993) which makes it difficult to distinguish whether being a child bride may be influenced by the average share of child brides in her community or by shared environmental factors[21], I use the previous share of child brides rather than the current share[22].

Similar to papers by Wodon et al. (2016) and Delprato et al. (2015), the past share of child brides is calculated by averaging the number of child brides of those currently aged 35-44 in the PSU. To insure no overlap occurs between the instrument and sample, the sample is restricted to those currently aged 22-34. Notwithstanding that share of non-premarital sex is a self-reported measure, Delprato et al. (2015) argue that this instrument is more likely to be valid and uncorrelated with the error term, as it captures the cultural dimension of communities and is not linked to socio-economic factors.

Results are presented in Table 7 and first stage results are presented in the appendix. The results are similar to those in Table 6, and show that child marriage does decrease educational outcomes. However, the magnitude is slightly greater than those results in table 6. Being married before the age of 18 and 21 is associated with a decrease in education years by 1.9 and 2.5, respectively. Additionally, these girls also experience a 5% percentage point and 6% percentage point decrease, respectively, in the probability of completing secondary school.

[21] It may be the case that a girl marries early because of the influence of her peers and family, or perhaps she and her peers are part of a community trapped in poverty that forces them to early marriage.

[22] A paper by Field and Zolitz (2017) estimates peer effects on academic achievement using past grade point average of the peers to avoid the reflection problem. I adopt a similar approach by using the past share of child brides to address the 'reflection problem'.

Table 7: Robustness check using community variables

	Yrs. Of Education	Yrs. Of Education	Yrs. Of Education	Completed Secondary	Completed Secondary	Completed Secondary
	1	2	3	4	5	6
Child Bride <18	-1.900**			-0.460***		
	-0.803			-0.159		
Child Bride <21		-2.459**			-0.595***	
		-1.074			-0.196	
Married between 10-14			-1.559***			-0.104**
			-0.279			-0.051
Married between 15-17			-0.528***			-0.0569**
			-0.129			-0.025
Married between 18-21			-0.252***			-0.0289*
			-0.0834			-0.0165
Married between 22-25			-0.0767			0.0189
			-0.0632			-0.013
Married between 26-29			-0.00426			0.0202
			-0.0583			-0.0131
Fraction of time exposed to Free Education Policy	0.307***	0.501***	0.305***	-0.00357	0.0433	-0.00142
	-0.113	-0.161	-0.103	-0.0207	-0.0304	-0.0171
Pregnant before Married	-0.407	-0.642	-0.0475	-0.168***	-0.224***	-0.0613***
	-0.309	-0.415	-0.0943	-0.0617	-0.0767	-0.0178
Husband completed Primary	4.328***	4.433***	4.503***	0.0506	0.0760***	0.107***
	-0.173	-0.139	-0.105	-0.0335	-0.0241	-0.0171
Husband completed Secondary	7.317***	7.504***	7.729***	0.0919	0.137***	0.221***
	-0.293	-0.227	-0.103	-0.0578	-0.0421	-0.021
Husband completed Higher	11.83***	11.71***	12.47***	0.580***	0.552***	0.772***
	-0.501	-0.563	-0.154	-0.102	-0.106	-0.0335
Rural	-0.758***	-0.688***	-0.797***	-0.0556***	-0.0386*	-0.0676***
	-0.109	-0.127	-0.0872	-0.0203	-0.0213	-0.0144
Number of survey responses husband and wife differed on	-0.594***	-0.513**	-0.645***	-0.0424	-0.0229	-0.0529**
	-0.189	-0.204	-0.162	-0.0323	-0.0358	-0.0264
Difference in education between husband and wife	-0.782***	-0.792***	-0.814***	-0.0277***	-0.0299***	-0.0373***

	-0.0244	-0.0221	-0.0129	-0.00474	-0.0039	-0.00243
Constant	2.876***	3.680***	2.558***	0.334***	0.529***	0.0952*
	-0.558	-0.923	-0.273	-0.114	-0.172	-0.0531
Observations	2,368	2,368	2,368	2,368	2,368	2,368
R-squared	0.807	0.797	0.836	0.254	0.306	0.495
Exogeneity Test	4.1(0.04)	5.1(0.02)	10.8(0.06)	5.4(0.02)	4.8(0.03)	18.3(0.00)
F-test	7.44	4.11	551.6	7.44	4.12	551.6
Sargan test	0.02(0.879)	0.02(0.879)	10.28(0.173)	0.00(0.993)	0.00(0.975)	16(0.03)

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

SECTION 8: WHAT NEXT?

This dissertation estimated the effect of child marriage on educational outcomes for women in Zambia, employing instrumental variables to address potential endogeneity. The main results in Section 6 indicate that girls who marry below the age of 18 and 21 have lower educational outcomes compared to those who marry later. These findings align with results from previous studies (Field and Ambrus, 2008; Wodon et al., 2017), which similarly found a negative impact of early marriage on educational attainment.

While the findings of this study contribute to the literature on child marriage and education, results should be interpreted with caution. The cross-sectional nature of the data limits the ability to make causal inferences about the relationship between child marriage and educational outcomes as specific information prior to marriage and the exact date of schooling completion were not available. However, despite these limitations, the study offers important insights into the detrimental effects of child marriage on educational attainment for girls in Zambia.

The results from this paper show some important insight into the education policies and their effect on early marriage. The OLS and IV analyses show that free basic education is effective in increasing girls' educational attainment. However, there is no evidence that it significantly deters

early marriage among girls married 10-14 in the first stage estimates. This finding suggests that while free basic education can increase educational outcomes for girls, it may not be sufficient to prevent early marriage entirely or ensure the completion of secondary education.

The recent implementation of free secondary education in Zambia in 2022 presents an opportunity for further research. Future studies could investigate whether the policy change has a more substantial impact on reducing child marriage rates and improving educational outcomes for girls. This could provide valuable insights into the effectiveness of educational policies that reduce costs in combating child marriage and promoting gender equality in education.

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Appendix Table 9: First stage results for Robustness with proportion share of women who had sex after marriage and past share of child brides as instrument

	Child Bride <18	Child Bride <21	Married between 10-14	Married between 15-17	Married between 18-21	Married between 22-25	Married between 26-29
Fraction of time exposed to Free Education Policy	0.0435	0.112***	-0.0321*	0.0756**	0.0906***	-0.0386*	-0.077***
	-1.4	-4.74	-0.0174	-0.0329	-0.0327	-0.0199	-0.00997
Pregnant before Married	-0.328***	-0.349***	-0.0849***	-0.243***	0.0486*	0.200***	0.0596***
	(-12.55)	(-12.66)	-0.00882	-0.0272	-0.0295	-0.0255	-0.0152
Husband completed Primary	-0.128**	-0.0565	-0.0655	-0.0627	0.107**	0.0131	0.0170**
	(-2.83)	(-1.93)	-0.0404	-0.0515	-0.0485	-0.0241	-0.00817
Husband completed Secondary	-0.317***	-0.169***	-0.134***	-0.183***	0.217***	0.0744***	0.0373***
	(-6.65)	(-5.10)	-0.0396	-0.0538	-0.0504	-0.0274	-0.0118
Husband completed Higher	-0.562***	-0.482***	-0.191***	-0.371***	0.175***	0.282***	0.119***
	(-10.24)	(-9.70)	-0.0417	-0.0601	-0.0643	-0.0497	-0.0258
Rural	0.0595*	0.0744**	0.018	0.0415	0.0157	-0.054***	-0.00931
	-2.12	-3.19	-0.014	-0.0292	-0.0283	-0.02	-0.00972
Number of survey responses husband and wife differed on	0.0513	0.0724	0.00277	0.0486	0.0366	-0.081**	-0.0199
	-1.13	-1.83	-0.03	-0.0477	-0.0497	-0.0325	-0.017
Difference in education between husband and wife	0.0246***	0.0151***	0.00919***	0.0154***	-0.015***	-0.008***	-0.003**
	-7.07	-4.61	-0.00229	-0.0035	-0.00398	-0.00321	-0.0015
Proportion of non-premarital sex by PSU	0.269***	0.207***	0.147***	0.122*	-0.123*	-0.102**	-0.0311*
	-4.32	-4.22	-0.0325	-0.0647	-0.0632	-0.0426	-0.0176
Past Share of Child Brides by PSU	-0.0288	-0.022	-0.0105	-0.0183	0.00625	0.0223	-0.00875
	(-0.92)	(-0.88)	-0.0174	-0.0328	-0.0325	-0.0211	-0.0116
Constant	0.571***	0.768***	0.161***	0.411***	0.205***	0.152***	0.0509***
	-9.4	-16.24	-0.0458	-0.065	-0.0655	-0.0415	-0.0178
Observations	2368	2368	2,368	2,368	2,368	2,368	2,368

Notes: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1