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On the impact of early marriage on schooling outcomes in Sub-Saharan Africa and South West Asia

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ABSTRACT

This paper examines the effect of age of marriage on women's schooling outcomes for 36 countries from Sub-Saharan Africa and South West Asia. We employ an instrumental variable approach to account for the endogeneity of early marriage driven by socio-economic and cultural factors. Our results show that delaying early marriage by one year is associated with an increase of half a year of education in Sub-Saharan Africa and nearly one third of a year of education in South West Asia as well as a lower likelihood of dropping out from secondary school of 5.5% in South West Asia.

1. Introduction

In the past decade, girls and young women – especially those from the poorest households – have faced unequal opportunities for educational access compared to boys and young men. It is estimated that only 70% and 56% of countries will meet the Education for All (EFA) goal of gender parity at the primary and lower secondary level by 2015 deadline, respectively (UNESCO, 2014). Sub-Saharan Africa (SSA) and South West Asia (SWA) are the regions where gender disparities in access and primary and lower secondary completion are most acute. Of the group of countries with the worst gender inequality in secondary education, 60% are in SSA, whilst SWA has two countries within this group (UNESCO, 2014).

Several factors have been put forward to explain gender disparities in education among which poverty and socio-cultural norms are crucial. On the socio-cultural norms, early or child marriage in SSA and SWA plays a pivotal role in the lack of success to reach gender parity. The highest prevalence of child marriages in the world is concentrated in SSA, while from the total of 60 million child marriages, 50% of young married girls reside in South Asia (ICRW, 2013). In addition, when interacted with poverty, the influence of socio-cultural norms (in particular of child marriage) on educational exclusion becomes more intense. Poorest girls are more than three times likely to marry by the age of 18 than those from the richest homes and the child marriage rate of girls with no schooling is three times larger compared with those who hold some secondary education (UNFPA, 2012).

Because low levels of schooling among young married girls can also be linked to common factors related to ability, poverty and backward traditional settings, the early marriage-education relationship is likely to be endogenously determined. Unfortunately, there is a lack of large quantitative studies on the link of age of marriage and women's education. The few country-specific studies exclude the effects that country and the community characteristics have on the association between early marriage and schooling. For example, Lloyd and Mensch (2008) explain how much of school dropout can be related to child marriage and early pregnancy in some African countries, however their empirical approach does account for endogeneity. Field and Ambrus (2008) employ a rigorous instrumental variables (IV) approach to address endogeneity of marriage and schooling decisions but their focus is on rural Bangladesh.

In this paper, we attempt to answer the following questions: Do the negative association of early marriage and women's educational attainment reflect unmeasured characteristics or the true consequence of young females' choices? Which indirect channels reinforce the lack of schooling achieved among young married women? We estimate the global regional effect that delaying the age of marriage has on three educational outcomes for women:

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years of education, literacy rates and lower secondary school dropout in 36 countries from the SSA and SWA regions. We fill the gap in the literature of early marriage and schooling by providing new evidence on robust global regional effects for a large group of countries than has previously been done and by examining the crucial role played by the community—where most marriage arrangements take place.

We also offer new insights on country and community determinants as mechanisms of transmission of "education poverty" from early marriage. For instance, whether there is a differential effect of conflict, institutional quality on the linkage of early marriage and schooling between countries or whether indirect channels (such as deprived health, low women's empowerment within households) may be additionally operating on the likelihood that young brides obtain low levels of schooling achievement in certain countries.

To evaluate the effect of timing of early marriage (i.e., the effect of postponing early marriage by one year) as well as the decision to marry early (i.e., to marry before age 18) have on women's schooling at the regional level, we apply a standard OLS procedure and an IV approach to account for the endogeneity early marriage driven by socio-economic and cultural factors. Our analysis, however, has the typical caveats of cross-section IV analysis: results show conditional statistical correlations rather than causality and there is also difficult to fully claim that instruments are strictly exogenous.

The paper is organised as follows. Section 2 provides a review on the factors behind early marriage and its consequences. In Section 3 we present the data and its descriptive statistics. Section 4 contains the OLS and IV estimates on the impact of early marriage on schooling outcomes and estimations of country and community indirect effects on the association of timing of early marriage and schooling. As a robustness check, in Section 5, we carry out estimations by SSA regions. Section 6 offers a summary of the main findings and their policy implications for effective policies aiming to increase educational achievement among young married girls.

2. Literature review

Early marriage, also known as child marriage, is used to describe the legal or customary union between two people, of whom one or both spouses is below the age of 18 (Article 1, Convention of the Rights of the Child, CRC). The practice disproportionally affects young girls. Child marriage is a serious human rights violation since it deprives girls from their future by denying them the right to decide when and with whom to marry (Davis et al., 2013). Because girls have not attained full maturity and the capacity to act autonomously (Dixon-Mueller, 2008), it leaves physical, emotional and psychologically deep scars that impede their overall development and well being.

Early marriage has a wide-ranging negative effect on girls beyond education. Girls who married young are more likely to suffer from psychological disadvantage (Ahmed et al., 2013) (e.g., lack of self-esteem and depression) and sexual abuse with increasing risks of sexual transmitted diseases and HIV (Clark, 2004; Clark et al., 2006). Young married girls also start child-bearing soon after marriage with increased health risks from complications in pregnancy and death during delivery, low-birth weight, and high risk of infant mortality (UNICEF, 2005; Godha et al., 2013; Raj et al., 2010). Young married girls are victims of long-term violence (Santhya et al., 2010) and, crucially, are deprived from basic education (Lee-Rife et al., 2012).

These effects spread to societies and regions at large. For instance, in low- and middle-income countries, complications from pregnancy and childbirth are a leading cause of death among girls aged 15–19 years (WHO, 2011). In SSA and SWA, with nearly 2.9 million of girls married by age 15, only 4% and 8% of literate girls are married by age 15 but around 20% and 25% of those who are not literate are married by this age (UNESCO, 2014).

Studies have found the following common structural drivers of child marriage across the world: gender discrimination, socio-cultural and religious values; economic survival strategies; value of virginity and protection of girls' sexuality; instability due to conflicts and weak law enforcement (Khanna et al., 2013; WLUML, 2013).

Gender inequality is one of the leading causes of child marriage. Families and communities see girls as having little importance outside of their roles as wives, while boys are given preference in the belief that they will look after their parents. On the other hand, girls are viewed as a financial burden which increases by delaying marriage as larger dowry needs to be paid. They occupy a lower status in societies and early marriage and explains why married girls are rarely found in school (often due to laws that prohibit their attendance or school practices that push them out of school). In contrast, men marry later, which significantly diminishes women's empowerment within households (Carmichael, 2011).

Gender inequality is often endorsed by socio-cultural traditions and religion. The view that women have the right to choose when to marry is inconsistent with patriarchal norms which see them as the property of fathers and husbands. Child marriage is also a route to strengthen family ties, clan and tribal connections or political alliances, and, sometimes, acts as a mechanism to settle obligations (Amin, 2011; UNIFPA, 2006). Moreover, social pressure operates in communities with high prevalence of early marriage where failure to conform can result in disapproval or shame for the family (Bayisenge, 2010).

Poverty is another major factor underlying child marriage. In families on low incomes, early marriage becomes a strategy of economic survival as the financial burden of raising the child is passed onto the husband. This strategy manifests in regions where mortality is high and poor rural areas, where girls need to become pregnant straight after marriage to maximise the number of pregnancies ensuring enough surviving offspring to satisfy household requirements for labour (Mathur et al., 2003).

The value attached to virginity before marriage is another channel which influences the incidence of child marriage. After girls reach puberty, parents worry about sexual assault or girls starting sexual activity early (Khanna et al., 2013). Protection from unwanted pre-marital sexual activity or a non-marital pregnancy is therefore accomplished by marrying girls at a young age (Lee-Rife et al., 2012).

At the macro level, conflict and weak law enforcement exacerbates the likelihood of early marriage for girls. In regions affected by wars or civil conflicts, where sexual abuse and rape are rampant, child marriage becomes a protection mechanism. SSA, where ethnicity can play a key role in the spread of civil wars (Bosker and de Ree, 2014), suffers from an endemic number of wars and civil conflicts. It is estimated that nearly 75% of SSA countries have been affected by armed conflicts (Poirier, 2012). Moreover, many countries have established laws prohibiting early marriage but more often these laws not enforced. In India, for example, all marriages need to be registered under the Compulsory Registration Act, 2006. But some state governments (e.g., Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh) have not taken the initiative to make it compulsory (Centre for Social Research, 2008). Overall, it is estimated that in 74 countries in the world which have reported to the Convention of the Rights of the Child (CRC) have not yet set the minimum age for marriage (Right to Education Project, 2013).

3. Data and descriptive statistics

This study is based on 36 Demographic and Health Surveys (DHS) from the SSA and SWA regions (MEASURE DHS, 2013a). The

DHS samples have the double advantage of providing nationally representative samples that are also comparable across countries (MEASURE DHS, 2013b). The DHS data provide rich socio-economic and health information while the primary sampling unit (PSU) in DHS surveys is the community, particularly ideal for our purpose as we are able to find relevant instruments—which are community measures.

The primary sample is women aged 20 to 29 years who first married or entered into union between the ages 11 to 17. There are at least two reasons for the choice of the working sample. First, the lower bound of 20 years of age is chosen as to not include girls below age 18 where it is uncertain whether they eventually will marry or not. Second, the upper bound of 29 years is chosen as to not overlap with one of the instruments, past incidence of early marriage for the 30–39 cohort. We also concentrate on women married between 11 to 17 years of age so that the left-hand cutoff point is binding for all three dependent variables. The same rationale for the choice of the working sample can be found in other studies (e.g., Field and Ambrus, 2008).

Table 1 contains summary statistics for the whole (age 15–49) and working (age 20–29) samples. For the whole sample, there are important differences on female school attainment for the two regions: years of education, literacy and enrolment at age 10 are between 83% and 74% lower in SSA and drop out twice as large if married early. In both regions, there are significant gaps in schooling outcomes also by the timing of early marriage. For example, the difference on years of education for women who married before age 15 is 38–39% that of women who married at 18 or older and similarly literacy rates are 33% and 47% lower. If women married before age 18 rather than before age 14, they would have achieved 0.82–0.94 more years of education and a 10% higher literacy rate.

Women who marry earlier are noticeably disadvantaged. For example, women are twice as likely to be underweight and five times as likely to have more than four children if married earlier. This gap is further amplified at the community level. In SSA, for example, stunting rates are 6% lower for women who marry later. Most early marriages happen in rural areas in SWA (71% in rural areas versus 59% in urban areas).

Table 2 shows that the level of income of a country also matters. There is a negative association between income and early marriage prevalence: 55% and 49% of women married before age 18 in low income and lower-middle countries, with only 26% in upper middle countries. In addition, SSA regions are far from homogenous—whereas one in four women married early in Southern Africa (SA), around 50% married early in Eastern Africa (EA), Middle Africa (MA) and Western Africa (WA).

We also use a range of country's variables to investigate the channels through which the association of age of marriage and

Table 1
Summary statistics.

	All (age 15-49)		Working sample (age 20–29)					
			First married (14 or younger)		First married (17 or younger)		First married (18 or older)	
	SSA	SWA	SSA	SWA	SSA	SWA	SSA	SWA
Schooling outcomes								
Years of education	3.76	4.91	2.04	2.92	2.86	3.86	5.28	7.65
Literacy	0.38	0.51	0.17	0.35	0.28	0.45	0.53	0.75
Enrolled at age 10	0.41	0.50	0.23	0.34	0.33	0.44	0.57	0.74
Dropout of lower secondary	0.41	0.19	0.55	0.44	0.55	0.31	0.34	0.12
Covariates: individual								
Marriage outcomes:								
Age of marriage	18.02	17.71	13.23	13.29	15.21	15.15	20.29	20.32
Husband age of marriage	20.15	20.91	18.21	16.91	18.41	17.43	17.55	15.55
Husband education - none	0.39	0.28	0.51	0.38	0.43	0.32	0.25	0.16
Husband education - primary	0.61	0.72	0.49	0.62	0.57	0.68	0.75	0.84
Husband education - secondary	0.30	0.52	0.20	0.36	0.25	0.44	0.41	0.68
Husband years of education	4.61	6.17	3.27	4.19	3.90	5.05	6.04	7.92
Household head—male	0.78	0.85	0.84	0.88	0.83	0.88	0.80	0.85
Socioeconomic and health background:								
Wealth	2.94	3.28	2.62	2.63	2.75	2.83	3.20	3.59
Worked (last 12 months)	0.72	0.40	0.66	0.41	0.67	0.39	0.67	0.31
Underweight	0.08	0.21	0.10	0.29	0.08	0.28	0.06	0.20
Anemia	0.58	0.49	0.57	0.44	0.58	0.45	0.60	0.50
Mother (17 or younger)	0.35	0.28	0.84	0.81	0.60	0.53	0.09	0.00
Number of children (4 or more)	0.40	0.24	0.31	0.19	0.22	0.13	0.06	0.02
Muslim	0.32	0.20	0.50	0.36	0.40	0.29	0.23	0.15
Covariates: community								
Rural	0.69	0.60	0.76	0.71	0.74	0.68	0.62	0.56
Education—at least secondary	0.18	0.38	0.12	0.30	0.15	0.32	0.21	0.41
Education quality	0.52	0.67	0.44	0.64	0.48	0.65	0.56	0.68
Number of children (4 or more)	0.31	0.21	0.58	0.34	0.53	0.28	0.42	0.18
Stunting	0.31	0.32	0.34	0.23	0.33	0.23	0.28	0.19
Muslim	0.48	0.22	0.35	0.37	0.33	0.36	0.30	0.29
Number of observations	277,668	140,856	105,314	50,777	105,314	50,777	105,314	50,777

Notes: (1) Source: authors' calculation based on latest DHS surveys (see Table 2 for list of countries). (2) Literacy is based on the respondent's ability to read all or part of a sentence. Respondents who had attended at least some secondary school were assumed to be literate. (3) Wealth is measured by an index by principal component on household assets and dwelling characteristics (see, Filmer and Pritchett, 2001; Rutstein and Johnson, 2004), and then divided into quintiles (poorest = 1, poor = 2,..,richest = 5). (4) Underweight is defined according to standard BMI cutpoint, less than 18.5 kg/m^2 (WHO Expert Consultation, 2004). (5) Anemia indicates poor nutritional status and it is a measured of low level of hemoglobin in the blood. (5) Communities' covariates are mean values of the community. (6) Education quality is measured by community proportion of women who had not become literate after completing 5 or 6 years of school. (7) Stunting is defined as the community proportion of moderate or severely stunted children whose height for age is less than two standard deviations from the median of the reference population (WHO, 2012) (8) Country covariates (e.g., GPD per capita, Education expenditure (% GDP)) are averages for the period 1990–2000 from the World Bank indicators (World Bank, 2013a).

Table 2
Countries, year, sample size, number of communities and early of marriage.

Income/Region/Country	Year	Sample size	Age of marriage (11–17)	First married (17 or younger)	First married (14 or younger)
Income groups					
Low		80,946	15.19	0.55	0.16
Lower middle		68,788	15.17	0.49	0.15
Upper middle		6356	15.54	0.26	0.06
Sub-Saharan Africa		105,313	15.21	0.52	0.15
Middle Africa		15,717		0.52	0.16
Cameroon	2011	4587	15.03	0.51	0.18
Chad	2004	2045	14.63	0.75	0.34
Congo	2011	3226	15.48	0.48	0.10
D. R. Congo	2007	3036	15.40	0.47	0.12
Gabon	2012	2054	15.35	0.43	0.11
Sao Tome and Principe	2008	769	15.85	0.47	0.06
Eastern Africa		41,185		0.47	0.12
Burundi	2010	2584	15.84	0.29	0.04
Ethiopia	2011	4722	14.94	0.59	0.19
Kenya	2008	2330	15.37	0.40	0.10
Madagascar	2008	5042	15.29	0.53	0.15
Malawi	2010	8349	15.49	0.57	0.13
Mozambique	2011	4278	15.24	0.52	0.15
Rwanda	2010	3152	15.98	0.17	0.02
U. R. Tanzania	2010	2765	15.67	0.45	0.08
Uganda	2011	2766	15.29	0.50	0.14
Zambia	2007	2217	15.64	0.51	0.09
Zimbabwe	2010	2,980	15.88	0.36	0.05
Southern Africa		4032		0.28	0.04
Lesotho	2009	1968	15.99	0.31	0.03
Namibia	2006	1267	15.48	0.28	0.07
Swaziland	2006	797	15.85	0.20	0.03
Western Africa		44,379		0.58	0.19
Benin	2006	6004	15.39	0.45	0.11
Burkina Faso	2010	5712	15.67	0.57	0.10
Côte d'Ivoire	2011	2798	15.25	0.48	0.14
Ghana	2008	1156	15.72	0.41	0.07
Guinea	2005	2182	14.96	0.74	0.25
Liberia	2007	1807	15.22	0.55	0.16
Mali	2006	5159	14.93	0.70	0.25
Niger	2006	3121	14.68	0.77	0.33
Nigeria	2008	9405	14.74	0.59	0.25
Senegal	2010	4762	14.90	0.52	0.19
Sierra Leone	2008	2273	14.81	0.61	0.22
South West Asia		50,777	15.15	0.50	0.16
Bangladesh	2011	6944	14.72	0.74	0.33
India	2005	33,211	15.23	0.48	0.15
Maldives	2009	3035	16.01	0.13	0.01
Nepal	2011	3695	15.38	0.53	0.13
Pakistan	2006	3892	15.21	0.45	0.14

Notes: (1) *Source*: authors' calculations based on latest DHS surveys. (2) Working sample (age 20–29). (3) Countries are grouped according to the World Bank income classification (World Bank, 2013b). (4) Sample size refers to the categorical measure of early marriage.

education is mediated. All country factors are calculated as averages for the period 1990–2000[1]. First, we include intensity and type of conflicts using the UCDP/PRIO Armed Conflict Dataset (version 4-2009). Intensity of conflicts are defined as minor (between 25 and 999 battle-related deaths in a given year) and wars (at least 1000 battle-related deaths in a given year). Types of conflict are divided into civil conflicts (internal and internationalized internal) and other conflicts (extrasystemic, interstate). Second, we incorporate a contestation and an inclusiveness index as a measurement of democratization (Coppedge et al., 2008; Coppedge, 2009). Finally, we look at the effects by income groups.

4. The effect of early of marriage on women's education: OLS and IV estimates

There can be unobservables which can affect both the decision of early marriage and educational outcomes which will biased its association, with educational differences explained by preexisting characteristics of women who marry young versus later. For example, girls who are weaker academically will have lower incentive to carry on education and their families will face lower losses by marrying them early in terms of forgone income. And since ability is positively associated to both female schooling and timing of marriage, the impact of marriage timing can be upper biased. At the same time, in some countries (e.g., Bangladesh, India) even non-poor families may have disincentive to invest in their daughters' schooling and delaying marriage since this will increase the price a girl has to pay as dowry payments rises as girls become older (Anderson, 2007).

To account for endogeneity, we employ three instruments which are measured at the community level: past age of marriage, proportion of non-premarital sex and total fertility rate. Note that using more valid instruments may yield closer estimate to the population average treatment effect (Angrist et al., 2010). We expect that previous average age of marriage in a community to be strongly correlated with current age of marriage in the same community since families' decisions to marry daughters young is a

[1] Note that the median year of marriage for the 20–29 age group working sample varies across countries from 1994 (Chad) to 2003 (Gabon).

socio-cultural phenomenon passed on through generations by social pressure and regarded as a family transaction of significant value—only feasible within the limits of a community (Bayisenge, 2010; Dekker and Hoogeveen, 2002). The second instrument, proportion of non-premarital sex, is an indication of the value the community attaches to girls' virginity and reflect safety concerns behind early marriage decisions. If families feel they cannot protect their daughters from latent risks, parents may consider early marriage as a safeguard against premarital sex and the responsibility to protect daughters from sexual harassment and violence is transferred from the family to the husband (Malhotra et al., 2011). The third instrument, community total fertility rate, embodies a survival strategy against poverty[2]. By marrying early, wives can maximise the number of successful pregnancies and surviving children to increase future household income (Mathur et al., 2003; Nour, 2006).

Although the instruments are "relevant" in the sense that they are expected to be correlated to women's decision to marry young, it is difficult to state that they are strictly exogenous or "valid". It is quite plausible that they are also correlated to the unexplained variation of women's schooling. In particular, large community fertility rates are associated with the prevalence of poverty in a community which in turn has an impact on the supply of schooling. Yet the other two instruments are less likely to be correlated with the error term. The value attached to virginity is, as well as protection mechanism, a cultural dimension of communities which is no linked to socio-economic factors and so it is more plausible to be proved valid. Past incidence of early marriage, on the other hand, is based on community level aggregate and is it unlikely to have a direct impact on schooling at the individual level. Nonetheless, we do not firmly claim that our IV estimates are unbiased.

The OLS impact of age of marriage on schooling is estimated by using the following model:

$$S_{ijk} = X_{ijk}\beta_1 + A_{ijk}\beta_2 + W_{jk}\psi + C_k\varphi + \epsilon_{ijk} \quad (1)$$

where the subscript ijk indicates female i in community j and country k, S_{ijk} is the indicator for female schooling, X_{ijk} denotes individual characteristics (male household head, employment, religion and nutrition), A_{ijk} is age of marriage, and W_{jk} community characteristics (place of residence, community education quality and community nutritional health) and C_k country characteristics[3]. Outcome variables are continuous (years of education) and categorical (literacy and lower secondary dropout). In the 2SLS estimation, A_{ijk} is replaced by $\hat{A}_{ijk}$, the prediction from the first stage regression[4], where the community exclusion restrictions are the three instruments contained in Z_{jk}:

$$A_{ijk} = Z_{jk}\gamma + X_{ijk}\beta_1 + W_{jk}\psi + C_k\varphi + \mu_{ijk} \quad (2)$$

Empirically, the data support our instruments' choice. Fig. 1 shows a strong correlation of the instruments with age of marriage. An increase of the past mean age of marriage of the community from 13 to 17 years is associated with nearly one year increase in current age of marriage. Similarly, a decline of premarital sex by 20% is related to a 0.2 years decrease of age of marriage. Additional checks further validate our instruments. We do not find significant difference on women's background by low/high values of the instruments and we do not find a direct effect of the instruments on women's schooling and, importantly, the inclusion of the alternative instrument community current mean of age of marriage (age group: 20–29) is rejected.

It should be noted that the analysis needs to be interpreted cautiously for two reasons. First, statistically significance does not imply causality between early marriage and education. Second, our IV identification strategy may suffer from lack of exogeneity of some of the instruments. This applies to the regression results in Tables 4–6.

4.1. Estimates for the impact of timing of early marriage

OLS and IV estimates for age of marriage in Tables 3 and 6 employ two models. The chosen specification is Model 1, which includes exogenous covariates. As a sensitivity analysis we also incorporate in Model 2 the potential endogenous covariates household wealth and husband years of education.

Table 3 contains first-stage results. For both regions, the degree of importance a community attaches to girls' virginity is a powerful instrument—beyond past incidence of early marriage. One year increase on the past mean age of marriage in the community implies a 0.09 and 0.013 rise on the current age of marriage in SSA and SWA, respectively. Community fertility rate is positively associated with the prevalence of early marriage (columns 2 and 4) but not with the timing of marriage. Hence, the economic survival dimension of early marriage though fertility is a mechanism which affects not the timing but the decision of whether to marry early or not. Instrument are not weak. The Kleibergen-Paap rk statistics are well above the critical value for weak instruments (Stock and Yogo, 2005).

Regressions for the dependent variable years of education are presented in Table 4. There are important differences on point estimates and the impact of unobservables by region. In SSA while results indicate that by postponing marriage by one year between ages 11 to 17 increases average years of education by 0.11, in SWA the effect of delaying marriage is of 0.28 year (Model 1). In SSA, however, the large impact of unobservables driving early marriage leads to a substantial downward biased of OLS estimates, increasing the effect from 0.11 in the OLS model to 0.54 in the IV model but not in SWA. That is why in SSA age of marriage we reject the null of exogeneity whereas in SWA we accept the null of exogeneity. The J statistic of the overidentifying restrictions test indicates that at least one instrument is not valid. Rejecting the null hypothesis of the test can also indicate that the model $X\beta$ for the conditional mean is misspecified (Cameron and Trivedi, 2009). This result and the probable correlation of the instruments with the unexplained variation in the schooling equation ($E(Z|\varepsilon) \neq 0$), lead to a cautious interpretation of the IV results.

As found in other studies (e.g., Huisman and Smits, 2009; Lewin and Sabates, 2012), the remaining covariates have expected signs. Working has a negative effect on years of schooling. Muslim women and women living in rural areas tend to have fewer years of schooling. Underweight women and women living in communities with high prevalence of stunting are more likely to complete fewer years of schooling. Wealth and husband years of education are powerful determinants of women's educational attainment.

Importantly, estimates for either chosen model (IV for SSA of 0.56 and OLS for SWA of 0.28) validate the fact that marriage postponement would yield a considerable increase in years of schooling among those women attending primary education—even with the further controls of Model 2. It should be noted that results are in line with Field and Ambrus (2008), which obtain an estimate of 0.22 for Bangladesh.

Table 5 shows the results for literacy and lower secondary dropouts. Delaying early marriage has a stronger influence on

[2] Community total fertility rate are calculated using the Stata module tfr2 (Schoumaker, 2013).

[3] Note that we do not control for other socio-economic and demographic variables typically used in models of school attainment (e.g., wealth, birth order, parental education) since these covariates are not observed at the time when early marriage decisions are made and they could be consequences of marriage decisions.

[4] We use a linear probability model for the latter outcomes model since the endogenous variable is not smoothly continuous.

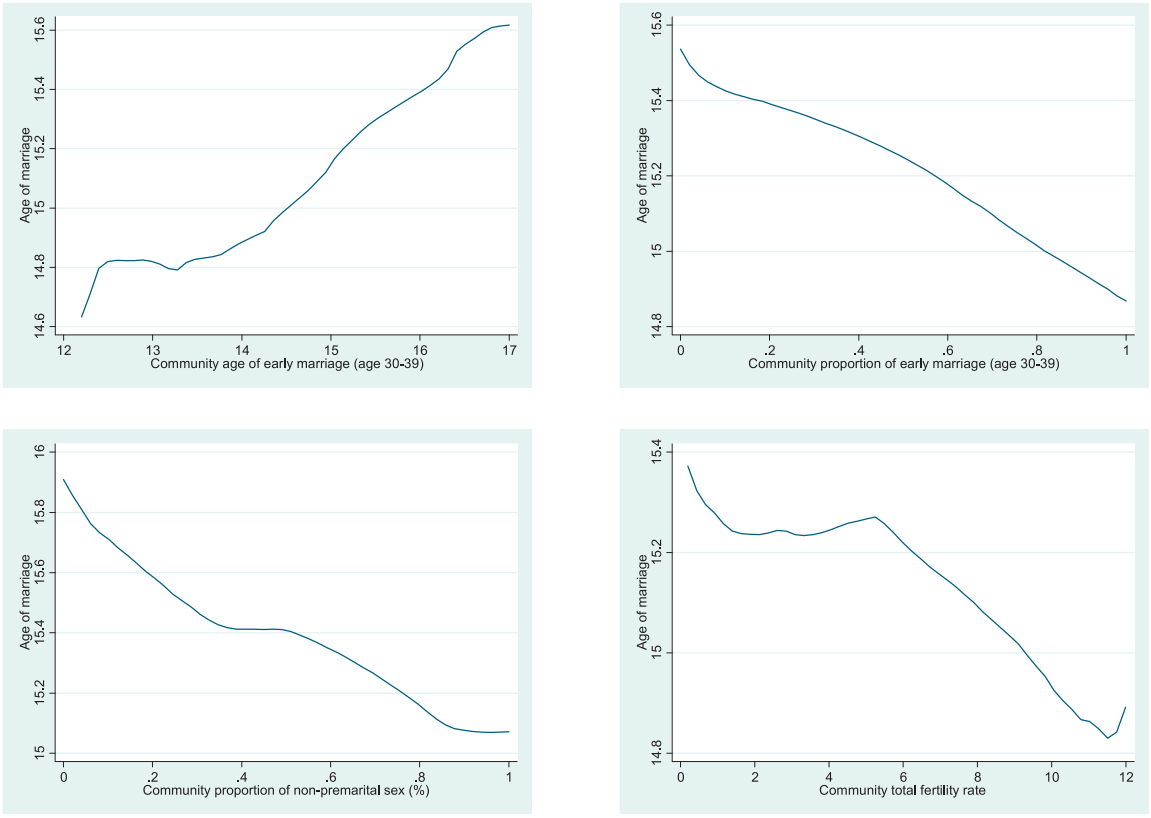

Fig. 1. Relationship of age of marriage and instruments.

literacy rates in SSA. This is perhaps explained by the larger literacy rates of SWA (0.45 for SWA and 0.23 for SSA, Table 1) and hence the marginal increment for SWA's women on the probability of being literate by delaying the age of marriage is lower. As for years of education, we reject the null of exogeneity of age of marriage for SSA (*C*-statistic = 30.08, *p*-value = 0.00) and accept it for SWA (*C*-statistic = 2.18, *p*-value = 0.14). This implies that each year of marriage delay is associated with 22.2% point increase in literacy in SSA while in SWA is of just 1.8%. The test of overidentifying restriction is rejected for both regions.

Table 3
First stage regression of early marriage - enrolled at age 10.

	Sub-Saharan Africa		South West Asia	
	Age of marriage	First married (17 or younger)	Age of marriage	First married (17 or younger)
Community age of early marriage (age 30–39)	0.090*** (0.012)		0.133*** (0.018)	
Community proportion of early marriage (age 30–39)		0.201*** (0.011)		0.308*** (0.013)
Community total fertility rate	0.003 (0.006)	0.026*** (0.002)	−0.001 (0.013)	0.021*** (0.003)
Community proportion of non-premarital sex	−0.199*** (0.052)	0.029** (0.012)	−0.712*** (0.215)	0.021 (0.042)
Household head—male	0.050* (0.026)	−0.014** (0.006)	0.057 (0.042)	0.013* (0.008)
Underweight	−0.079* (0.048)	0.003 (0.010)	−0.05 (0.033)	0.037*** (0.007)
Worked—last 12 months	−0.051** (0.023)	0.015*** (0.005)	−0.138*** (0.032)	0.044*** (0.006)
Muslim	−0.276*** (0.032)	0.062*** (0.007)	−0.240*** (0.043)	0.131*** (0.010)
Age	0.000 (0.004)	−0.020*** (0.001)	−0.031*** (0.005)	−0.008*** (0.001)
Community—rural	0.000 (0.025)	0.028*** (0.006)	−0.022 (0.032)	0.033*** (0.007)
Community—education quality	0.287*** (0.034)	−0.059*** (0.008)	0.063 (0.054)	−0.018 (0.011)
Community—stunting	−0.011 (0.053)	0.025** (0.012)	−0.249*** (0.079)	0.094*** (0.016)
Constant	14.124*** (0.219)	0.661*** (0.025)	14.046*** (0.365)	0.580*** (0.051)
Partial R^2	0.005	0.02	0.008	0.029
Weak identification test (Kleibergen-Paap rk statistic)	26.275	319.485	28.155	292.754
R^2	0.027	0.058	0.059	0.137
N	17,813	46,119	11,033	29,661

Notes: Standard errors clustered at the community level are reported in parentheses. Additional controls are country dummies, GDP (per capita) and education expenditure (% GDP).

* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Table 4
Effect of age of marriage on years of education - enrolled at 10.

	Sub-Saharan Africa				South West Asia			
	OLS		IV		OLS		IV	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Early marriage	0.110*** (0.012)	0.096*** (0.011)	0.543*** (0.204)	0.312* (0.186)	0.284*** (0.014)	0.227*** (0.013)	0.372** (0.182)	−0.07 (0.178)
Household head—male	−0.224*** (0.040)	0.006 (0.042)	−0.244*** (0.043)	−0.006 (0.044)	−0.244*** (0.061)	0.023 (0.060)	−0.247*** (0.061)	0.054 (0.064)
Underweight	−0.023 (0.071)	0.052 (0.068)	0.018 (0.075)	0.072 (0.069)	−0.373*** (0.046)	−0.142*** (0.043)	−0.368*** (0.047)	−0.145*** (0.044)
Worked—last 12 months	−0.113*** (0.037)	−0.041 (0.035)	−0.092** (0.039)	−0.032 (0.036)	−0.285*** (0.047)	−0.098** (0.044)	0	−0.126*** (0.049)
Muslim	−0.326*** (0.052)	−0.230*** (0.049)	−0.181** (0.085)	−0.159** (0.078)	−0.263*** (0.066)	−0.202*** (0.062)	−0.240*** (0.084)	−0.273*** (0.079)
Age	−0.001 (0.006)	−0.006 (0.005)	−0.001 (0.006)	−0.006 (0.006)	0 (0.007)	−0.01 (0.007)	0.003 (0.009)	−0.020** (0.009)
Community—rural	−1.220*** (0.042)	−0.397*** (0.045)	−1.217*** (0.043)	−0.406*** (0.047)	−0.511*** (0.050)	−0.036 (0.048)	−0.508*** (0.050)	−0.02 (0.050)
Community—education quality	−0.302*** (0.061)	−0.375*** (0.057)	−0.432*** (0.090)	−0.439*** (0.081)	−0.034 (0.086)	−0.011 (0.077)	−0.041 (0.088)	0.015 (0.080)
Community—stunting	−0.447*** (0.089)	−0.172** (0.080)	−0.429*** (0.092)	−0.166** (0.081)	−0.910*** (0.119)	−0.517*** (0.106)	−0.885*** (0.132)	−0.578*** (0.115)
Wealth—poor		0.305*** (0.045)		0.303*** (0.046)		0.295*** (0.065)		0.313*** (0.068)
Wealth—middle		0.582*** (0.047)		0.578*** (0.048)		0.640*** (0.066)		0.660*** (0.068)
Wealth—rich		0.895*** (0.053)		0.884*** (0.054)		0.851*** (0.068)		0.893*** (0.074)
Wealth—richest		1.643*** (0.064)		1.622*** (0.067)		1.741*** (0.079)		1.825*** (0.093)
Husband years of education		0.145*** (0.005)		0.143*** (0.006)		0.129*** (0.006)		0.140*** (0.009)
Constant	6.292*** (0.236)	3.700*** (0.235)	−0.379 (3.138)	0.404 (2.826)	4.587*** (0.307)	3.195*** (0.293)	3.228 (2.812)	7.610*** (2.667)
R^2	0.114	0.206	0.916	0.929	0.089	0.207	0.938	0.943
Overidentification test (Hansen J statistic)			154.90 (0.000)	49.98 (0.000)			14.28 (0.001)	6.91 (0.032)
(p-value)								
Exogeneity test			4.06 (0.044)	1.15 (0.284)			0.20 (0.658)	2.41 (0.120)
(C-statistic) (p-value)								
N	17,813	17,813	17,813	17,813	11,033	11,033	11,033	11,033

Notes: Standard errors clustered at the community level are reported in parentheses. Additional controls are the country dummies, GDP (per capita) and education expenditure (% GDP).
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Table 5
Effect of age of marriage on literacy (enrolled at age 10) and lower secondary dropouts.

	Sub-Saharan Africa				South West Asia			
	OLS		IV		OLS		IV	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Outcome—literacy								
Early marriage	0.027*** (0.002)	0.026*** (0.002)	0.222*** (0.041)	0.183*** (0.039)	0.018*** (0.002)	0.015*** (0.002)	0.046* (0.024)	0.013 (0.026)
R^2	0.181	0.206	0.639	0.684	0.08	0.097	0.899	0.903
Overidentification test (Hansen J statistic) (*p*-value)			59.57 (0.000)	31.64 (0.000)			29.65 (0.000)	17.24 (0.000)
Exogeneity test (*C*-statistic) (*p*-value)			30.08 (0.000)	20.03 (0.000)			2.18 (0.140)	0.04 (0.836)
N	18,328	18,328	18,328	18,328	10,959	10,959	10,959	10,959
Outcome—lower secondary dropouts								
Early marriage	−0.006 (0.004)	−0.006 (0.004)	0.214*** (0.082)	0.191** (0.078)	−0.055*** (0.004)	−0.046*** (0.004)	−0.112** (0.048)	−0.086* (0.048)
R^2	0.083	0.125	0.421	0.474	0.05	0.112	0.324	0.377
Overidentification test (Hansen J statistic) (*p*-value)			12.08 (0.002)	3.78 (0.151)			10.45 (0.005)	27.86 (0.000)
Exogeneity test (*C*-statistic) (*p*-value)			9.05 (0.003)	7.76 (0.005)			1.43 (0.232)	0.61 (0.435)
N	8580	8580	8580	8580	8781	8781	8781	8781

Notes: Standard errors clustered at the community level are reported in parentheses.
* $p<0.10$.
** $p<0.05$.
*** $p<0.01$.

Estimates for lower secondary dropouts are displayed in bottom part of Table 5. A comparison of estimates by region provides an insight into the timing of the events of dropping out of lower secondary and age of marriage. In SWA, where timing of marriage is exogenous, OLS estimates of Models 1 and 2 show that a decrease in dropouts rates of 5.5%–4.6% by each additional year that the marriage decision is delayed. In contrast, in SSA, postponing early marriage by one year increases the probability of dropouts by 19.1% (IV estimate—Model 2 with additional controls, where additional instruments are valid at 15% by the *J*-statistic). These results suggest that girls in SWA leave secondary school as a consequence of marriage whereas in SSA most of lower secondary dropouts are before marriage.

4.2. Estimates for the impact of the early marriage (categorical)

As additional evidence, Table 6 contains estimates using a categorical formulation of early marriage. Unless timing of marriage, which was exogenous in SWA, the decision to marry early is endogenous across the three measures of schooling. We also reject the null of exogeneity even when controlling for additional covariates in Model 2, which highlights the weight that socio-cultural unobserved factors have on both the chances that a girls marries young and the level of her educational attainment. This affects both regions, and SSA and SWA IV estimates are therefore similar by region. Girls who married young have between 5–6 years lower years of schooling and 50.2% and 22.2% lower probability of being literate in SSA and SWA, respectively.

4.3. Country and community indirect effects

In this section we investigate which country or community characteristics add another layer of disadvantage to young wives by increasing the association of timing of marriage with their schooling outcomes.

To begin with, we explore how the impact of age of marriage is explained by country features. That is, we fit by OLS Eq. (1) with an additional term containing the interaction between age of marriage and country characteristics,

$$S_{ijk} = X_{ijk}\beta_1 + A_{ijk}\beta_2 + W_{jk}\psi + C_k\varphi + (A_{ijk} \times C'_k)\beta_3 + \epsilon_{ijk} \quad (3)$$

where C'_k includes variables related to conflicts, democracy and income group dummies. Due to space constraints, we report results for the dependent variables years of education and literacy[5]. Moreover, for each country, we investigate the effect of community determinants W'_j (location, wealth, stunting and women's empowerment) on the timing of early marriage-schooling relationship. Formally, we estimate,

$$S_{ij} = X_{ij}\beta_1 + A_{ij}\beta_2 + W_j\psi + \left(A_{ij} \times W'_j\right)\beta_3 + \epsilon_{ij} \quad (4)$$

where the last term represents the interaction between community characteristics and age of early marriage we choose as dependent variable S_{ij} years of education.

Estimates for country's mediating effects are included in Table 7. Results show that conflicts have a positive impact on the timing of marriage-years of education relationship and a negative association with literacy. This may suggest that due to the low population enrolment in schools of conflict-affected countries where education opportunities are scarce the gains of delaying marriage are higher, while in the case of literacy the effect is

[5] Results for lower secondary dropouts are available from the authors upon request.

Table 6
Effect of early marriage (categorical) on schooling outcomes.

	Sub-Saharan Africa				South West Asia			
	OLS		IV		OLS		IV	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Outcome—years of education								
Early marriage	−1.077*** (0.026)	−0.819*** (0.023)	−5.040*** (0.293)	−2.179*** (0.248)	−1.969*** (0.034)	−1.496*** (0.031)	−5.736*** (0.291)	−3.972*** (0.284)
R^2	0.171	0.313	0.865	0.922	0.218	0.352	0.899	0.929
Overidentification test (Hansen J statistic) (*p*-value)			152.79 (0.000)	60.04 (0.000)			75.05 (0.000)	57.64 (0.000)
Exogeneity test (*C*-statistic) (*p*-value)			194.44 (0.000)	29.25 (0.000)			194.58 (0.000)	79.09 (0.000)
N	46,119	46,119	46,119	46,119	29,661	29,661	29,661	29,661
Outcome—literacy								
Early marriage	−0.102*** (0.004)	−0.084*** (0.004)	−0.502*** (0.032)	−0.336*** (0.034)	−0.058*** (0.004)	−0.042*** (0.004)	−0.222*** (0.022)	−0.153*** (0.024)
R^2	0.156	0.185	0.767	0.802	0.062	0.081	0.933	0.937
Overidentification test (Hansen J statistic) (*p*-value)			36.48 (0.000)	20.90 (0.000)			55.73 (0.000)	35.82 (0.000)
Exogeneity test (*C*-statistic) (*p*-value)			164.83 (0.000)	57.09 (0.000)			50.93 (0.000)	18.89 (0.000)
N	47,277	47,277	47,277	47,277	29,174	29,174	29,174	29,174
Outcome - lower secondary dropouts								
Early marriage	0.174*** (0.007)	0.142*** (0.006)	0.669*** (0.073)	0.199** (0.080)	0.169*** (0.006)	0.131*** (0.006)	0.387*** (0.039)	0.246*** (0.042)
R^2	0.107	0.17	0.346	0.508	0.07	0.125	0.194	0.276
Overidentification test (Hansen J statistic) (*p*-value)			84.03 (0.000)	61.80 (0.000)			4.67 (0.099)	21.53 (0.000)
Exogeneity test (*C*-statistic) (*p*-value)			51.05 (0.000)	1.10 (0.295)			33.80 (0.000)	7.95 (0.005)
N	26,860	26,860	26,860	26,860	25,785	25,785	25,785	25,785

Notes: Standard errors clustered at the community level are reported in parentheses.
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

Table 7
Countries' determinants effects on the association of timing of early marriage with schooling outcomes (years of education and literacy)—OLS.

	S1	S2	S3	S4	S5	S6	S7
Outcome—years of education							
Early marriage	0.120*** (0.013)	0.126*** (0.013)	0.140*** (0.010)	0.121*** (0.012)	0.164*** (0.013)	0.177*** (0.012)	0.184*** (0.009)
Early marriage × conflict intensity	0.136*** (0.025)						
Early marriage × civil conflict		0.109*** (0.024)					
Early marriage × contestation			0.103*** (0.015)				
Early marriage × inclusiveness				0.128*** (0.017)			
Early marriage × low income					0.026 (0.018)		
Early marriage × lower middle income						−0.001 (0.018)	
Early marriage × upper middle income							−0.162*** (0.043)
R^2	0.089	0.087	0.089	0.089	0.082	0.081	0.078
N	28,846	28,846	28,846	28,846	33,059	37,298	5243
Outcome—literacy							
Early marriage	0.024*** (0.003)	0.025*** (0.002)	0.025*** (0.002)	0.026*** (0.002)	0.024*** (0.002)	0.019*** (0.002)	0.022*** (0.002)
Early marriage × conflict intensity	−0.007 (0.005)						
Early marriage × civil conflict		−0.009** (0.004)					
Early marriage × contestation			−0.015*** (0.003)				
Early marriage × inclusiveness				−0.014*** (0.003)			
Early marriage × low income					−0.005 (0.003)		
Early marriage × lower middle income						0.006* (0.003)	
Early marriage × upper middle income							−0.012* (0.007)
R^2	0.159	0.158	0.166	0.169	0.156	0.156	0.156
N	29,287	29,287	29,287	29,287	34,024	37,702	4725

Notes: Standard errors clustered at the community level are reported in parentheses. Same controls as previous Tables (Model 1) and direct effects of each country variable.
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

somewhat smaller. Because in countries with stronger foundations of democratic institutions legislation on preventing child marriage is enforced there is a lower prevalence of early marriage which, in turn, may explain the weaker association of timing of age of marriage and literacy (from 0.025 to 0.10 for every year young women delay marriage). For the dependent variable years of education the gains of delaying age of marriage are larger for women living in more inclusive societies. High per capita income does not have a differential impact within low and lower middle income countries—both groups have similar prevalence of early marriage of 55% and 49%, respectively (see Table 2). But in upper middle income countries the effect is considerable smaller. For example, for years of education, the effect is only over 2% while for low/lower middle it is around 17% for each additional year of marriage postponed.

We now turn to individual country estimations and the indirect effects of community determinants. Of the 36 countries included in the sample, age of marriage has a statistically significant impact on years of education for 22 countries (see Table 8). There is a substantial level of heterogeneity on the gains from delaying age of marriage across these countries, varying from 0.10 in Kenya to 0.47 in Zimbabwe. Of the community channels going from early marriage to women's schooling (years of education) we find that poverty and location of a community are the powerful mediating factors in some countries. For instance, in Burkina Faso and Liberia, where there is a lack of a significant impact of the direct effect of age of marriage, for rural communities the effect is of 0.37 and 0.32, correspondingly. Similarly, in Malawi, women living in rural communities would attain a twofold increase in their years of schooling if they could postpone marriage by one year as compared to those women from urban communities. The effect of community poverty is large too. For the four countries with a significant positive effect, married woman living in poor communities losses between 0.42 and 0.61 more years of schooling on average as compared to those living in non-poor communities. Community stunting rates and mother's low BMI are a further dimension of disadvantage for young wives in some countries. Note that the proportion of severe stunted children is an indication of irreversible long term health problems within a community. In Burundi and Guinea disadvantaged young wives living in those communities show further losses of 0.68 and 3.45 on years of schooling.

Besides socio-economic and health factors, women's empowerment within households is fundamental. Because young wives have not acquired full maturity at the time of marriage, they are thereafter subject to psychological, domestic violence and sexual abuse which is then reflected in lower autonomy on their education decisions (Jensen and Thornton, 2003). Here we explore the question of how young wives relative low bargaining power affects their schooling prospects across countries. We employ four indicators of lack of empowerment: proportional difference on the age of husband and wives; and presence of domestic violence (i.e. beating justified) if wives go out without telling husbands or argue or if they refuse to have sex. Large spousal age gap characterises relationships where younger brides have less power (Carmichael, 2011). The other indicators measure the extent to which physical violence affects freedom of movement, threat as well as sexual behaviour (Ackerson and Subramanian, 2008; Murphy-Graham, 2010).

We find that lower autonomy in decision making through large age spousal gaps and domestic violence is an indirect channel which further sets back the possibility of educational attainment of early marriage women. Crucially, Table 8 confirms that empowerment has far reaching effects across countries than

Table 8
Community determinants on the effect of age of marriage on years of education – OLS.

Country	Early marriage coefficient	Rural	Poor community	Community stunting	Under-weight	Not Empower1 (ratio age hubs/wife)	Empower2 (not beaten if going out)	Empower3 (not beaten if argue)	Empower4 (not beaten if refuse sex)
Bangladesh	0.350***	−0.015	0.038	−0.142	0.021	0.044	0.034	−0.04	−0.026
Benin	−0.055	0.137	−0.073	−0.303	−0.329	−0.102	0.067	0.357*	−0.136
Burkina Faso	−0.024	0.369*	0.009	−0.372	0.164	0.237	0.105	−0.084	−0.091
Burundi	0.033	−0.163	0.503	0.678*	0.312*	0.432***	−0.266	−0.049	0.015
Cameroon	0.109**	−0.004	−0.017	0.11	−0.687*	−0.025	−0.309***	−0.215**	−0.251**
Chad	0.049	−0.141	−0.034	−0.641	0.541	0.231	–	–	–
Congo	0.041	−0.079	−0.095	−0.204	0.18	0.169**	0.157*	–	−0.172*
Côte d'Ivoire	−0.007	0.347	0.610*	−0.311	0.04	−0.256	−0.383	−0.279	0.083
D. R. Congo	0.130**	−0.013	0.172	0.136	0.151	−0.007	0.088	0.03	0.01
Ethiopia	0.084	0.014	−0.096	0.157	0.14	0.021	−0.259**	−0.14	−0.181
Gabon	−0.051	0.038	0.420**	0.534	0.403	−0.093	−0.036	−0.031	−0.275
Ghana	0.069	−0.321	−0.222	0.062	−0.392	−0.136	−0.317	−0.085	−0.155
Guinea	−0.316*	−0.107	0.939	3.452***	1.210***	0.039	−0.713	0.18	−0.311
India	0.258***	−0.057	−0.156***	−0.194**	−0.038	0.041	−0.05	−0.024	−0.074
Kenya	0.098*	0.027	−0.193	0.249	0.098	−0.055	0.038	−0.147	−0.111
Lesotho	0.195**	−0.421**	−0.481**	−0.193	−0.216	−0.065	−0.044	−0.243	−0.102
Liberia	0.04	0.316*	0.595***	0.054	−0.153	0.037	0.096	−0.181	−0.274
Madagascar	0.242***	−0.056	−0.195	−0.454	0.177	−0.16	−0.323*	0.076	−0.042
Malawi	0.151***	0.143*	0.076	0.013	−0.129	0.080*	−0.006	0.044	−0.032
Maldives	0.112*	−0.064	−0.112	0.108	−0.481*	0.047	−0.361*	−0.294	−0.222
Mali	0.199**	−0.059	−0.059	−0.272	−0.085	−0.152	−0.003	0	0.037
Mozambique	0.153***	−0.07	−0.164	0.054	0.144	0.122**	−0.182	−0.088	0.462*
Namibia	0.160*	0.423**	0.426*	0.152	−0.023	0.071	0.201	0.239	−0.063
Nepal	0.216***	−0.003	−0.093	−0.201	−0.512**	0.077	–	0.176***	–
Niger	0.043	−0.023	0.017	0.136	−1.221	−0.028	−0.191	−0.266*	−0.206
Nigeria	0.151***	−0.170**	−0.151	0.01	0.153	0.182**	−0.157*	−0.048	−0.165*
Pakistan	0.244***	−0.098	−0.43	−0.443	–	0.017	1.283***	1.283***	2.782***
Rwanda	0.084	−0.222	0.253	−0.281	−1.758	0.023	−0.129	0.168	−0.067
Sao Tome and Principe	0.257***	0.016	−0.304	−0.925	−0.16	0.054	−0.148	−0.217	−0.157
Senegal	0.150**	−0.166	−0.167	−0.127	−0.111	0.284***	−0.231	−0.201	−0.199
Sierra Leone	0.175*	0.053	−0.273	0.074	0.278	−0.028	−0.067	0.042	−0.12
Swaziland	0.251	−0.603*	−0.422	0.475	–	−0.245	0.146	0.405	0.195
U. R. Tanzania	0.147***	0.122	−0.011	0.012	−0.294	0.000	−0.145*	−0.035	−0.021
Uganda	0.116**	−0.025	−0.279*	−0.105	−0.21	0.169*	0.188**	0.085	0.074
Zambia	0.140***	−0.05	0.031	−0.262	0.183	−0.024	0.007	−0.053	0.057
Zimbabwe	0.472***	0.021	−0.102	0.573	0.513**	−0.07	−0.315**	−0.216*	−0.288**

Notes: Standard errors clustered at the community level are reported in parentheses. Same controls as previous Tables (Model 1) except from country variables. Underweight and empowerment variables are individual women indicators.

* $p < 0.10$.

** $p < 0.05$.

*** $p < 0.01$.

socio-economic and health factors. Large age difference between spouses cofounds the impact of timing of early marriage in seven countries. In Senegal, for example, it is related to nearly a third of a year of education lost. The second indicator, loss of autonomy through physical violence, is also statistically significant in seven countries. Here coefficients are negative as the indicator measures if a woman is empowered. In average, empowered women with freedom of movement and more autonomy loss fewer 0.27 additional years of schooling as compared to early married women who are not empowered and lack of autonomy in decision-making. The third and fourth indicators, measuring concrete violence if a wife argues or refuses to have sex, are significant in fewer countries.

5. Estimates by Sub-Saharan regions

In this section we investigate which specific SSA regions are driving the whole sample results for SSA. Table 9 shows the results for SSA regions. For the outcome years of education, IV estimates for MA and SA are not statistically significant. OLS effects of age of marriage on years of education are of 0.061 (for MA) and 0.161 (for SA). But for SSA as a whole the IV estimate is 0.543 (see Table 4). Hence, this result is primarily explained by the large impact that delaying age of marriage has on schooling years in EA and WA. In EA, for example, the IV estimate of 1.634 indicates that by putting into effect the minimum age of marriage limit to 18 would increase the number years of schooling of young married girls by 3.27 years in the EA region.

The benefits of delaying age of marriage in terms of increasing literary rates are more evenly distributed across SSA regions. Only in SA controlling for unobservables leads to statistically insignificant effects. In the MA and WA regions IV estimates are similar (0.135 and 0.179, in that order) while, as before, EA displays the leading effect (=0.239).

Moreover, omitted variables are not related to dropout decisions on SA and WA, where both OLS and IV estimates lack statistical power and age of marriage is not endogenous. Note that the whole estimates of 0.214 for SSA of Table 4 are driven entirely by MA (=0.296) as EA's estimates, controlling for unobservables, is negative (=−0.234). In general, differential on regional estimates imply distinct channels through which observed individual and community characteristics as well as unobservables affect schooling within SSA regions. Above all this is evident from EA's and WA's estimates and for dropouts.

Table 9
Effect of early marriage on schooling outcomes by SSA regions.

	Middle Africa		Eastern Africa		Southern Africa		Western Africa	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Years of education								
Age of marriage	0.067*** (0.024)	0.22 (0.225)	0.189*** (0.016)	1.634*** (0.459)	0.161*** (0.057)	5.232 (3.630)	0.075*** (0.026)	0.791** (0.337)
R^2	0.123	0.926	0.09	0.861	0.087	0.336	0.066	0.878
Overidentification test (Hansen J statistic) (*p*-value)		62.45 (0.000)		114.79 (0.000)		0.14 (0.934)		42.93 (0.000)
Exogeneity test (*C*-statistic) (*p*-value)		0.17 (0.679)		14.52 (0.000)		21.63 (0.000)		2.53 (0.111)
N	3787	3787	8859	8859	848	848	4319	4319
Literacy								
Age of marriage	0.009** (0.004)	0.135*** (0.043)	0.034*** (0.003)	0.239*** (0.075)	0.027*** (0.010)	0.16 (0.210)	0.032*** (0.005)	0.179*** (0.056)
R^2	0.11	0.72	0.139	0.681	0.087	0.845	0.155	0.487
Overidentification test (Hansen J statistic) (*p*-value)		12.95 (0.002)		43.89 (0.000)		7.35 (0.025)		28.86 (0.000)
Exogeneity test (*C*-statistic) (*p*-value)		8.56 (0.003)		8.90 (0.003)		0.06 (0.803)		9.56 (0.002)
N	3967	3967	8974	8974	853	853	4534	4534
Lower secondary dropouts								
Age of marriage	−0.009 (0.007)	0.296*** (0.086)	−0.028*** (0.006)	−0.234* (0.120)	−0.019 (0.021)	−0.183 (0.157)	0.004 (0.008)	0.158 (0.112)
R^2	0.062	0.288	0.078	0.522	0.032	0.593	0.025	0.251
Overidentification test (Hansen J statistic) (*p*-value)		5.92 (0.052)		59.95 (0.000)		2.51 (0.285)		1.93 (0.382)
Exogeneity test (*C*-statistic) (*p*-value)		20.66 (0.000)		4.41 (0.036)		1.37 (0.241)		2.49 (0.114)
N	2255	2255	3997	3997	343	343	1985	1985

Notes: Standard errors clustered at the community level are reported in parentheses. Same controls as previous Tables (Model 1) except from country variables.
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

6. Discussion

In this article we estimated the impact of early marriage on educational outcomes for 36 countries from SSA and SWA using three measures of educational attainment: years of education, literacy and lower secondary dropouts. We employed an IV approach to account for endogeneity between education and early marriage decisions. Our findings, however, need to be interpreted cautiously. Although we found that instruments are relevant and not weak, they could possibly be related to unmeasured variation of women schooling decision. Thus, we do not fully claim that our IV estimates are unbiased. Moreover, statistical significance does not necessarily imply causality—i.e., early marriage decisions may also be seen as a survival strategy after leaving formal schooling. Indeed, while our data is cross sectional, strong causality arguments would require a panel data structure.

6.1. Main findings

The study's results can be summarised in two main findings. First, the decision to marry young and also at which age this occurs have significant effects on schooling—more than previously thought without controlling for unobservables. Second, both country's macro features and communities' socio-economic and health background and women's empowerment have an important role on the heterogeneity of the early marriage-schooling association. We discuss each finding's implication below.

Even controlling for ex-post marriage outcomes (such as husband years of education and household wealth), early marriage has a separate effect on women's education. Unobserved socio-economic and cultural factors behind early marriage lead to a substantial downward biased of OLS estimates. We found that, postponing the decision to marry young by just one year, would increase attainment among young married women in SSA by 0.54 additional years of schooling and by 22% point increase of literacy, while the benefits within the SWA region would be comparative lower (of 0.22 for years of schooling) due to region relatively larger access, but would decrease dropouts by 5% at lower secondary. Our findings add to the scarce literature (e.g., Field and Ambrus, 2008; Nguyen and Wodon, 2012) on the schooling effects of timing of marriage, corroborating the long-lasting detrimental educational effects for young wives.

Globally, our results confirmed that ending the early marriage practice will considerably boost the schooling attainment for those attending primary education. If existing laws on early marriage were enforced an increase of 39% and 15% on years of schooling will be accomplished in SSA and SWA, respectively. Likewise, lower secondary dropouts could be reduced by 11% in SWA with strong legislation. Importantly, OLS results significantly under-estimate the regional educational gains on years of schooling by 30% in SSA and by 10% in SWA.

On country mediating effects we found that conflicts and quality of institutions to be significant as country mediators on the schooling and timing of early marriage relationship, which suggests that accountability and law enforcement to combat child marriage is endogenous to societies' social structure. It is then not surprising that countries with the lowest age of marriage (e.g., Mali, Niger and Bangladesh), poor institutional quality coupled with socio-cultural factors lead to the ineffectiveness of current laws on child marriage (UNFPA, 2012).

In terms of prevention of additional educational disadvantage among young married girls, poverty, health, community location

and women's empowerment in particular are over-reaching determinants. We found that, on average, young married women living in poor communities loss an additional 0.5 years of schooling as compared to those living in non-poor communities, while in some countries rural communities are associated with additional losses between 0.14–0.42 less years of schooling for young wives.

Lack of empowerment for women within households is a large driver too. We found, for instance, that loss of autonomy through physical violence of husbands has powerful negative effects in seven countries—leading to an extra 0.3 year of schooling lost among young wives. The argument behind its strong effect is that the extent of freedom of movement and autonomy in decision-making for women is a sign of social norms of societies and cultural traits (Doss, 2013). This is in line with the evidence of effectiveness of child marriage programs. Strongest programs (e.g., Kishori Abhijan in Bangladesh and PRACHAR in India) are those that work directly with girls, empowering them with information, skills and support networks (Glennerster and Takavarasha, 2010).

6.2. Policy implications

Eliminating early marriage is fundamental for countries with significant education gender disparities. This study identified three core elements for reducing the negative education effects of early marriage: (i) widen access of good quality education to girls; (ii) provide comprehensive community programs to tackle poverty, health, sexual and reproductive health and domestic violence issues; (iii) raise women's empowerment through initiatives that challenge societies' prevailing perceptions of gender roles.

Delaying marriage may not lead to more schooling in settings where schooling opportunities are limited. By expanding the quantity and quality of education opportunities marginalised girls will benefit the most. More educated girls have more input into who and when to marry; they delay marriage to focus on work; and it is more difficult and costly to find them a husband (Jejeebhoy, 1995; Lloyd and Young, 2009). This cycle can be partly broken by school policies (such as conditional cash transfers and scholarships) keeping girls at school (Glennerster and Takavarasha, 2010). Better quality education would increase schooling returns and may make parents' investment on girls' education more justifiable (Malhotra et al., 2011). Expansions should be primarily targeted towards rural areas with a poor state of public education with access to girls made a priority.

Empowerment in an educational context is insufficient and it should be accompanied by community programs simultaneously addressing other drivers of early marriage. We found that a 1% increase of community fertility rate is associated with over a 2% increase on prevalence of early marriage, establishing the economic survival dimension behind early marriage through maximising fertility. Once married young, poverty and health acts as further mechanisms of transmission of education poverty. For instance, in Côte d'Ivoire, women residing in poor communities achieve 0.6 less years of schooling than young married women living in non-poor communities.

Although several poverty-alleviation measures and nutrition intervention component are found in child marriage initiatives (e.g., ELA Centers in Bangladesh; Maharashtra Life Skills in India; Zomba Cash Transfer in Malawi), they are a necessary but not a sufficient condition in improving young wives educational opportunities. Improved household bargaining power of young wives can play a significant part. Our results show that the absence of domestic violence and greater autonomy for young wives are associated with higher levels in schooling attainment. In Cameroon, for instance, 0.31–0.22 fewer years of education. Hence, including this additional criterion when targeting high risk communities on poverty and health grounds should be a priority. There are some efforts in this direction. In Plan Nepal protection of women and girls from gender-based violence coexists within child marriage initiatives (Plan Nepal et al., 2012). Similarly, the SAFE Project in the urban slum of Dhaka, Bangladesh, jointly addresses child marriage and gender based violence (Amin et al., 2012).

Changing socio-cultural perceptions on women's role in a society are essential for interventions to function. The fact that laws are rarely enforced and are ineffective to deter child marriage typifies this—as they are often seen as incompatible with deeply rooted countries' socio-cultural traits. Our empirical finding that the degree of importance a community attaches to girls' virginity is the most powerful instrument in the IV approach, not only for the incidence of early marriage but also of the timing of marriage, points in the same direction. Parental and community engagement to change social norms acknowledging girls' rights in society must be the first step towards eliminating gender inequality in education due to early marriage.

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