Schoolgirls Not Brides: Secondary Education as a Shield Against Child Marriage*

Hélène Giacobino,† Elise Huillery,‡ Bastien Michel,§ Mathilde Sage**

July 2022

Abstract

We examine whether alleviating financial and logistical barriers to secondary education can reduce child marriage. Using a randomized controlled trial including 285 localities in Niger—ranked last in gender development, we show that offering a scholarship upon admission to middle school halves both school dropout and child marriage. The mechanisms explaining these effects are changes in girls' human capital, preferences, and aspirations. There are no displacement effects on non-beneficiary girls so the scholarship creates unambiguously large social benefits. This paper shows that financial aid for education conditional on a minimal condition (registration) has the potential to transform girl adolescents' life.

Keywords: Child Marriage, Education, Women Empowerment, Externalities, Niger
JEL Codes: I2, J1
Study pre-registration status: This study is registered in the AEA RCT Registry and the unique identifying number is AEARCTR-0003296: https://www.socialscienceregistry.org/trials/3296

* We gratefully acknowledge funding from the Sahel Women Empowerment and Demographic Dividend (SWEDD) Project in Niger and the UK Foreign, Commonwealth & Development Office (awarded through J-PAL Post-Primary Initiative). This project would not have been possible without the support of the Ministry of Secondary Education, the Ministry of Women's Promotion and Child Protection, and the Ministry of Public Health, Population and Social Affairs of Niger, the Project Coordination Unit of the SWEDD Project (in particular, Ali Doungou Boubacar and Ibrahim Moctar Moustapha), the World Bank Health Nutrition and Population Global Practice, and the World Bank Africa Gender Innovation Lab. The authors are also grateful to NGOs ONEN and Hikima for implementing the intervention, and to the National Institute of Statistics of Niger for collecting the survey data. Finally, we are also grateful to Olivier Francès for excellent research assistance. The study received IRB approval from the Paris School of Economics (ref.: 2019-001). The trial was registered in the AEA RCT Registry (AEARCTR-0003296). The authors have no conflict of interest to declare. The usual disclaimer applies.

† J-PAL.
‡ Université Paris Dauphine – PSL and J-PAL. Corresponding author, email: elise.huillery@dauphine.psl.eu
§ Paris School of Economics and Aarhus University.
** Université Paris Dauphine – PSL.

1. Introduction

Throughout the world, more than 650 million of women living today – including 21 percent of young women aged 20 to 24 – were married before their 18th birthday (UNICEF, 2018).[1] While the pervasiveness of child marriage has substantially decreased in South Asia in recent years, the practice remains widespread in West and Central Africa, where 41 per cent of women aged 20-24 were married before age 18, with little progress in the past 10 years. Globally, progress would need to be 12 times faster than the rate observed over the past decade to meet the Sustainable Development Goals' target of elimination by 2030.[2]

In addition to being a blatant violation of children's and women's rights, child marriage has major consequences on women's life trajectories. To begin with, child marriage reduces educational attainment because married women tend to drop out of school early to take care of household chores (Field and Ambrus, 2008; Hicks and Hicks, 2019; Sunder, 2019). This prevents girls from building the human capital they would need to pursue some form of professional career and reduces their participation in the labor market (Sunder, 2019). The use of health care practices also declines significantly because of child marriage (Field and Ambrus, 2008). Moreover, correlational studies also show that women who marry young tend to begin childbearing earlier (Jensen and Thornton, 2003), which can be highly detrimental for their health, as adolescent girls are more likely than adult women to experience pregnancy and delivery complications such as hypertension, obstructed labor, and fistula, which increases both maternal and child morbidity and mortality (Raj, 2010). Women who marry young also tend to have less decision-making power in the household and are more likely

[1] Child marriage disproportionately affects women, with one in five women aged 20-24 concerned, compared to one in 30 young men.

[2] The information in this paragraph was retrieved from the UNICEF website (last accessed in February 2022). The prevalence of child marriage among young women can be found here: https://www.unicef.org/protection/child-marriage and the prevalence of child marriage among young men can be found here: https://www.unicef.org/press-releases/115-million-boys-and-men-around-world-married-children-unicef

to experience domestic violence (Jensen and Thornton, 2003). The consequences of child marriage even seem to span beyond the lives of married women as their children tend to be in poorer health condition and to perform less well in school than the children of women who marry later (Sekhri and Debnath, 2014; Chari et al., 2017; Sunder, 2019).

A crucial question to address is which policy can be most effective in reducing child marriage. To date, in many sub-Saharan African countries, it is legal for a girl to marry before the age of 18 if her parents consent. Hence, a first natural approach would consist in passing laws prohibiting individuals from marrying before the age of 18. However, a major problem with this approach is that these laws are rarely enforced effectively. Indeed, even in countries where it is illegal for a girl to marry under the age of 18, people still largely abide by religious or traditional rules rather than legal ones for marriage-related decisions, thus limiting the influence legislators can have on marriage practices (Maswikwa et al., 2015; Diarra et al., 2019; Wilson, 2021).[3] This partly explains why the prevalence of early marriage remains so high and why new approaches are needed to address this problem.

This article examines whether alleviating financial and logistical barriers to secondary education can thwart plans for early marriage. To do so, girls starting middle school (aged about 13) were offered a scholarship covering the costs of secondary education (*i.e.*, housing, food, and school supplies) upon admission to middle school. In principle, the effectiveness of this policy may stem from three potential mechanisms: first, an "incapacitation effect," whereby schooling could reduce the time available for relationship building (Black et al., 2008); second, a "modernization effect," whereby education could increase one's ability to decode information and make better choices,

[3] For example, Wilson (2021) studies the effect of child marriage bans in 17 low- and middle-income countries and shows that they had modest effects on the prevalence of child marriage and average age at marriage, particularly in rural areas.

inculcate achievement motivation, and help in the diffusion of modern values such as equality and freedom; finally, a "human capital effect," whereby additional education increases future human capital, which could change the opportunity cost of getting married and having children.

The setting of this study is Niger, which ranks last in the gender inequality and gender development indices (UNDP, 2019). In this country, 76 percent of women aged 20-24 got married before age 18 and 28 percent before age 15. In addition, the fertility rate is the highest in the world with 6.8 children per woman, and girls' secondary school enrollment rate is only 21 percent.[4] While rural areas account for 83% of Niger's population,[5] the network of middle schools is sparse outside of cities, so that enrollment in a secondary school requires overcoming both logistical challenges related to finding housing near the school, and financial challenges related to the direct costs of education and the opportunity cost of sending a child to school instead of having them do housework or engage in economic activities.[6] In this context, the Ministry of Population, the Ministry of Women's Promotion and Child Protection, and the Ministry of Secondary Education in Niger designed an intervention to reduce marriage among adolescent girls by eliminating the direct costs of secondary education. Girls admitted to middle school were offered a scholarship for a period of three school years from 2017-2018 to 2019-2020, amounting to USD 306 per year, on the condition that they would remain enrolled and would not repeat more than one year. Although this intervention is promising, its effectiveness may be undermined in contexts which, like Niger, are characterized by strong conservative gender norms, low women empowerment, poor quality education, and limited labor market opportunities.

[4] Child marriage rate comes from UNICEF (2019), fertility rates from UN (2019), and enrollment rates from https://data.worldbank.org/indicator/SE.SEC.ENRR.FE (last accessed in February 2022).

[5] Niger Rural Population 1960-2021 | MacroTrends

[6] Opportunity costs can be particularly high given that girls play a central role in households' economic activities, as they are often responsible for selling household products (whereas the mobility of wives and mothers outside the home is often limited).

To measure the impact of the intervention, we implemented a randomized controlled trial as part of which 285 villages (totaling up to 2,400 eligible adolescent girls) were randomly assigned to one of three groups: 1) a pure control group in which no girl was offered the scholarship; 2) a full treatment group in which all eligible girls were offered the scholarship; and 3) a mixed treatment-and-control group in which half of the eligible girls were randomly selected to be offered the scholarship, but not the other half. This two-stage randomization design allows us to measure not only the direct impacts of the intervention on treatment girls, but also village-level externalities on non-treatment girls – to evaluate the overall social benefit of the policy. We collected information on eligible and non-eligible girls upon completion of the intervention in August 2020.

We find that the intervention transformed the lives of eligible girls in important ways. First, recipients were 21 percentage points less likely to have dropped out of school at endline, representing a 53 percent decrease. Second, the intervention reduced by 49 percent the probability for girls to be married at endline. If we focus on girls above 18 at endline, only 4 percent have married as a child in the treatment group compared to 21 percent in the control group. Providing financial support to girls in middle school thus proves to be a powerful policy to reduce child marriage among girls starting middle school. IV estimates indicate that each additional year spent in middle school by compliers decreases the probability of getting married by 19 percentage points. Third, another important result is that the gains in education and delayed marriage boosted girls' subjective wellbeing, as the intervention increased life satisfaction by 0.25 standard deviations above the mean in the control group, which is a substantial improvement. Overall, alleviating financial barriers to middle school generates unambiguous large benefits for treated girls.

Importantly, we find evidence suggesting that the effects of the intervention are likely to last beyond the mere duration of the scholarship. In particular, the intervention increased girls' aspirations as well as the aspirations their mothers have for them in every dimension studied: education, work,

and family. Indeed, treatment girls were eight percentage points more likely to aspire to complete high school, 16 percentage points more likely to aspire to pursue higher education (a 53 percent increase), and seven percentage points more likely to aspire to a modern (*versus* traditional) occupation (a 10 percent increase). They also wished to get married later. Similar trends are observed with respect to mothers' aspirations for their daughter.

In terms of mechanisms, evidence suggests that the effect of education on marriage is not merely due to an incapacitation effect, but that increased human capital and a modernization of opinions also play a role. First, the intervention improved girls' academic skills by 0.16 standard deviations, mostly driven by mathematical skills, which in itself may change girls' labor prospects. Second, we observe some changes in girls' opinions in favor of more modern social norms: treatment girls' reported ideal age of marriage is higher for both men and women, and so is the ideal length of education for their future children. They are also less likely to agree with the opinion that men should earn money for the family, and less likely to agree that a husband can beat his wife if she refuses to have sex with him. These changes indicate a modernization of girls' views of the society in which they live, and not just the views they may have of their own personal lives.

Finally, we find no evidence of externalities, suggesting that the social benefits of the intervention are unambiguously large and positive. First, we find that the improvement of treatment girls' situation neither improved nor deteriorated the marital and educational situation of non-treatment girls in the village – be they eligible or not –, indicating the absence of both snowball (positive) and displacement (negative) effects. Symmetrically, we also find no reduction in the impact of the intervention on treatment girls when only half of eligible girls are treated in the village, suggesting that the efficiency of the intervention on treatment girls is not affected by non-treated peers (no undermining effect).

This study contributes to several strands of literature. The first of these strands concerns the financial barriers to secondary education. The first barrier is obviously tuition fees, which have been eliminated in most countries at the primary level but continue to prevent many students from accessing secondary education, as shown in recent papers (Blimpo et al., 2019; Duflo et al., 2021; Brudevold-Newman, 2021). Second, in countries which have eliminating tuition fees, the costs of supplies, uniforms, and housing, as well as the opportunity costs, are still an important concern, especially for rural households. In this context, an extensive literature has focused on measuring the impact of different types of non-tuition financial transfers. Transfers differ in the nature of the conditions attached to them, ranging from no conditions to strict conditions (*e.g.*, regular daily attendance or relative academic proficiency) that require heavy-going verification mechanisms. To date, evidence suggests that unconditional cash transfers do not significantly increase school enrollment (Akresh et al, 2013; Baird et al, 2011), while transfers with strong conditionality, such as standard CCT programs, tend to achieve positive results. However, the effect sizes of CCT programs remain limited (at best a 10-percentage point increase in enrollment rates) compared to the high monitoring and implementation costs associated with the verification mechanisms (Schultz, 2004; Baez and Camacho, 2011; Ahmed et al, 2007; Friedman et al, 2011; Baird et al, 2011; Akresh et al, 2013; Alam et al, 2011; Chaudhury and Parajuli, 2010; Glewwe and Kassouf, 2012). There are far fewer studies testing cash transfers with light conditionality (*e.g.*, school registration or no grade repetition). Benhassine et al. (2015) find that a "labelled" cash transfer for primary school children in Morocco increased the enrollment rate by 7 percentage points. Filmer and Shady (2014) find that a cash transfer conditional on registration and no grade repetition in Cambodia led to a 20-percentage point increase in middle school enrollment. Finally, Giordono and Pugatch (2021) find that a non-tuition scholarship in The Gambia led to an increase in enrollment in Grade 7 and 8 but no impact in older grades. We contribute to this literature by providing evidence that a large scholarship covering

the non-tuition costs of education has a large effect on education attainment, and is possibly more cost-effective than transfers contingent to strong conditions such as CCT programs. This finding is even more interesting given that Niger is a country where the quality of education is low and gender norms are very conservative, two features that would theoretically increase the need for strong conditionality. Our paper thus makes the case for eliminating the full cost of secondary education, not only tuition fees, without imposing strong conditionality.

The second literature to which we contribute concerns the impacts of secondary education on women empowerment. The general picture emerging from this literature is mixed, and there is no consensus on the impact on child marriage. Indeed, several studies find that increased participation in secondary education has no impact on child marriage (Angrist et al., 2002; Alam et al. 2011; Friedman et al., 2016; Filmer and Shady 2014; Baird et al., 2011; Gulesci et al., 2020), which suggests that girls who respond to the educational intervention are not those who would have gotten married as a child absent the treatment. On the other hand, other studies find that secondary education can cause a reduction in child marriage (Duflo et al., 2015; Ferré, 2009; Duflo et al., 2021), as well as other improvements in life outcomes such as increased political knowledge, greater decision power, or reduced fertility (Friedman et al., 2016; Gulesci et al., 2020; Duflo et al., 2021; Ozier, 2018).

This mixed evidence is puzzling and further research is needed to understand in which contexts secondary education can foster women empowerment. We make three contributions to this literature. First, we examine the effect of secondary education in one of the least developed countries in the world, where barriers to women empowerment are among the strongest in the world and the quality of education is particularly poor (Malpel, 2016). Our article shows that secondary education may be a powerful shield against early marriage even – or maybe especially – in the poorest countries where child marriage bans proved rather inefficient (Wilson, 2021). Along the same lines, our article also shows that less proficient girls benefit more than high-performing ones, which may indicate that

governments should extend access to middle school to lower-performing primary school students. Second, we carefully analyze the potential mechanisms to try to determine why and how education affects life outcomes, especially human capital and modernization effects. We also highlight the effects on girls' personal aspirations for themselves and the aspirations that mothers have for their daughter – something that has been surprisingly overlooked until now. A major finding is that parental preference for early marriage is not a deep unwavering cultural trait, but is instead quite malleable and responsive to financial support in favor of girls' education. Finally, a third contribution of this paper is the analysis of welfare impacts. Increasing human capital and women's decision power may not always be associated with improved welfare as it can create some conflicts or psycho-social disutility (Ashraf et al., 2014). Our paper shows that the alleviation of barriers to secondary education does not come with such disutility, but on the contrary leads to gains in life satisfaction.

Finally, this paper contributes to the literature on externalities and peer effects in relation to adolescents' education- and marriage-related decisions, with important consequences for public policy evaluation and policy efficiency. Our two-stage randomization design allows us to examine whether the effects of the intervention depend on the intensity of treatment within the village, and to identify potential positive and negative externalities on non-treatment girls (snowball and displacement effects respectively), which are critical to determine the overall program impact (Crépon et al., 2013; Baird et al., 2018). Only a few papers examine the externalities of educational cash transfers: they find negative effects on sisters (Barrera-Osorio et al. 2011) and positive ones on non-eligible peers (Bobonis and Finan, 2009; Lalive and Cattaneo, 2009). Our findings contrast with these papers since we find no externalities on either sisters or non-treated peers living in the same village, in terms of both schooling and marriage decisions. We also test for possible undermining effects on treatment girls when only a portion of eligible girls are treated, and also find none.

The remainder of the article is organized as follows: we describe the context and intervention in Section 2, our empirical strategy in Section 3, and our data and sample characteristics in Section 4. Section 5 presents the direct impacts on treatment girls, and Section 6 the externalities on non-treatment girls. Finally, Section 7 concludes.

2. Context and intervention

2.1. Education and marriage of girls in Niger

In Niger, primary school enrollment rates have increased tremendously in the recent past, going from 32 percent in 2000 to 70 percent in 2014.[7] While girls' enrollment rate is still below that of boys, this increase has been particularly marked for them, as their enrollment rate rose from 26 to 64 percent.[8]

Yet, secondary education remains rare, especially for girls. In 2016, 65 percent of girls finished primary school but only 36 percent started and 14 percent completed middle school (for boys, these figures are respectively 78, 47, and 18 percent). Several factors are traditionally put forward to explain these low enrollment rates in middle school, such as the direct and opportunity costs of sending a working-age individual to school, long distances to middle school, safety concerns, and the poor quality of education. For instance, in 2014, only 10 percent of Nigerien students met minimum skills requirements in literacy and 8 percent in mathematics by the end of primary school (Malpel, 2016).

In West Africa, where early marriage and pregnancy are pervasive, child marriage is also seen as one of the main reasons for the low enrollment of girls in secondary education, married life being considered incompatible with the pursuit of education (Perlman et al., 2018). Among the main causes

[7] These figures correspond to gross enrollment rates: https://data.worldbank.org/indicator/SE.PRM.ENRR?locations=NE (last accessed in February 2022).

[8] Unless specified otherwise, all statistics cited in this subsection were compiled by the UNESCO Institute for Statistics and are accessible from the World Bank Open Database. For instance, data on primary school gross enrollment rate can be found on: https://data.worldbank.org/indicator/SE.PRM.ENRR?locations=NE (last accessed in February 2022).

of early marriage, the fear of premarital sex and pregnancy is a particularly important concern for parents from the onset of puberty. To avoid their disastrous reputational consequences for the girl and her family, parents often arrange for a girl's marriage as soon as the signs of marriage readiness begin to appear.[9] The cultural emphasis on a woman's role as wife, the lack of social and economic alternatives, the absence of role models, and the lack of autonomy in their childhood home are other causes of early marriage that can help explain why it is actually a desired outcome for many young women.

In this context, an important policy question is whether overcoming the financial and logistical barriers to middle school enrollment is sufficient to delay marriage.

2.2. The intervention

"*Toutes les Filles à l'Ecole"* (thereafter, TFE) is an intervention designed by the Government of Niger to promote secondary education among young adolescent girls. By increasing the number of years of education, its objectives are to increase girls' human capital, delay the age at which they get married, and ultimately improve their level of agency and empowerment.[10] It targets a population of young girls with particularly low secondary school enrollment: girls living in rural localities with no secondary school, who would therefore have to travel sometimes long distances to attend school.[11]

[9] The arrival of puberty alone does not justify the desire to marry a young girl. Other factors such as changes in her behavior reflecting an increased desire for independence, or a growing interest from and in boys are also taken into account. However, these changes usually begin to manifest themselves after puberty.

[10] All Girls in School is implemented as part of a larger project, the Sahel Women Empowerment and Demographic Dividend (SWEDD), which aims to improve the lives of "adolescent girls 10-19 years old in rural communities with high prevalence of child marriage, teenage pregnancies, gender-based violence and early-school drop-out" through various interventions. More information about the SWEDD project can be found here:
https://www.worldbank.org/en/results/2020/10/16/accelerate-learning-earnings-and-agency-of-adolescent-girls-and-young-women-in-and-around-the-sahel (last accessed in July 2022)
https://wcaro.unfpa.org/sites/default/files/pub-pdf/SWEDD_ENG.pdf (last accessed in July 2022)

[11] According to 2018-2019 administrative data (and our own calculations), 44 percent of the girls who start secondary school live in the locality where the secondary school is located, 22 percent come from a village located 1 to 5 km away from the secondary school, 21 percent come from 5 to 10 km away, and 13 percent come from over 10 km away.

To achieve its goal, TFE offers a three-year scholarship to girls who have been admitted to middle school. As secondary school is officially tuition-free, the scholarship is designed to cover housing and food costs incurred by a family hosting the girl in her secondary school locality (XOF 15,000—USD 25.5 per month from October to June),[12] as well as other expenses incurred by the girl herself such as out-of-pocket expenses for school supplies and uniforms (XOF 5,000—USD 8.5 per month). The scholarship money was brought in cash to the girls' middle school, which was then responsible for giving it to girls' families. In total, the program provides each recipient and her host family with XOF 180,000, or USD 306 per year, which represents 53 percent of Niger's GDP per capita (USD 573 in 2018).[13] It should be noted that the host family system is a long-standing tradition in Niger and is implemented with the help of the school committees (COGES), which generally take care of finding host families. In that sense, the scholarship can be seen as addressing some market imperfections, namely credit constraints, that may lead to suboptimal household investments in education. In addition, girls were given access to remedial tutoring in French and mathematics for four hours per week to support their learning. The tutoring classes were provided by schoolteachers who received special training as part of the intervention, although access to remedial tutoring was open to other students in the school.

To be eligible to the program, girls had to meet a few eligibility criteria. First, they had to live in rural villages with no secondary school. Second, they had to come from a family considered as vulnerable. Typically, daughters of civil servants were deemed ineligible whereas daughters of farmers were eligible. According to the lists of girls admitted to middle school in the study villages, 97 percent of these girls were farmers' daughters, meaning that virtually every girl in the study villages was considered vulnerable. Finally, girls had to be academically qualified (Grade 5 GPA

[12] XOF 1 = USD 0.0017 (themoneyconverter.com).

[13] The characteristics of the scholarships distributed within the framework of this project are identical to those considered by the Nigerien State as set out in Order No. 00338 MES/SG/DGFEC/DPSF of 21 November 2014.

above 4 out of 10)[14] and to behave well (no disciplinary problem in Grade 5). To enter the program, girls had to apply to the nearest secondary school at the end of Grade 5 through their primary school committee. Secondary school committees were then responsible for determining whether applicants met all the above criteria and could therefore be deemed eligible to a scholarship.[15] The scholarship keeps on being distributed to the recipients as long as they remain enrolled, regardless of attendance. Girls may repeat a grade once, but they lose the scholarship if they repeat more.

It is important to note that the distribution of scholarships encountered a variety of implementation issues inherent to the local context. For example, very few schools had a bank account through which scholarships could be distributed. The creation and centralization of the lists of eligible girls, their selection, as well as the organization of money transfers, is such a long process that girls were only made aware of whether they would benefit from the scholarship in February 2018 and received the first payment in June 2018, that is at the end of the school year.[16] Over the course of the following two years of the program, payments were also delayed and irregular. Hence, our study provides realistic estimates of the impact of the intervention in contexts characterized by important administrative, logistical, and financial constraints.

[14] Grade 5 corresponds to CM2 (Cours Moyen, 2nd year).

[15] More specifically, the identification of girls eligible for a scholarship followed the following steps: 1) The Ministry of Secondary Education prepared the data sheets and made them available to school committees (COGES); 2) School committees gave the data sheets to primary school principals; 3) Primary school principals had the students and their families fill in the data sheets; 4) Students returned the completed forms to school committees; 5) School committees reviewed the completed forms and drew up a list of eligible girls.

[16] In total, three cohorts of girls have benefited from the intervention. While this study focuses on the first cohort of potential recipients, similar delays and problems were encountered in the distribution of scholarships to recipients in subsequent cohorts. It should be noted that the 2nd and 3rd cohorts of girls were selected in villages distinct from those concerned by this study.

3. Empirical strategy

3.1. Sampling strategy

Our sample is constituted of 285 villages located in five of the country's seven regions: Dosso, Maradi, Tahoua, Tillabéry, and Zinder. Only two regions, Agadez and Diffa, were excluded from the study, the former because its fertility rate is lower than in the rest of the country and the latter for security reasons. The villages were selected by the Ministry of Primary Education, Literacy, Promotion of National Languages and Civic Education using the 2012 census data. The selection criteria included high rates of early marriage and pregnancy, low enrollment rates in secondary education, and the absence of a secondary school.

In each of the 285 selected villages, all girls who were deemed eligible, had started middle school in October 2017, and were still in school at the time of the baseline survey in December 2017 were included in the study. The study sample totals up to 2,360 girls.

3.2. Identification strategy

These 285 villages were randomly divided into three groups: a pure control group in which no girl was offered a scholarship *(C_{100})*; a full treatment group in which all eligible girls were offered a scholarship *(T_{100})*; and a mixed treatment-and-control group in which half of the eligible girls were randomly selected to be offered a scholarship *(T_{50}),* but not the other half *(C_{50})*. The random draw was carried out at the village level and was stratified by region. It generated three groups of 95 villages, each group representing approximately 785 eligible girls.

In this study, our main objective is to compare eligible girls in T_{100} and in C_{100}, which allows us to estimate the direct impact of the intervention. Our secondary objective is to study the importance of externalities between treated and non-treated adolescent girls. Our design posits that externalities

would happen primarily within villages and identifies distinct types of externalities: undermining effects whereby the presence of non-treated girls may reduce the direct impact on treated girls; snowball effects whereby non-treated girls might indirectly benefit from the presence of treated girls; and displacement effects whereby non-treated girls might indirectly suffer from the presence of treated girls.

Figure 1 summarizes the study design and maps the location of control group villages (in white), treatment group villages (in dark blue), and mixed group villages (in light blue).

3.3. Estimation strategy

First, we measure the direct impact of offering scholarships to eligible girls. To do so, we restrict our focus to control group villages where no girl was offered a scholarship (C_{100}) and treatment group villages where all eligible girls were offered a scholarship (T_{100}). For each outcome y_i, we estimate the following equation:

$$y_{i,j} = \alpha + \beta_{T_{100}} T_{100,i} + \mu_j + X_i\beta + \varepsilon_{i,j} \qquad \textbf{(Eq. 1)}$$

In this equation, $T_{100,i}$ is a dummy variable indicating that a girl comes from a village located in region *j* belonging to treatment group T_{100}, and μ_j is a vector of region fixed effects. The parameter of interest is $\beta_{T_{100}}$, which captures the intent-to-treat estimate of the intervention's effect. We estimate a first version of this equation without baseline covariates and a second version including individual baseline covariates X_i selected using a double lasso procedure (Belloni et al., 2014).

Second, we study the strength of externalities between eligible treatment and non-treatment girls. To do so, we estimate the following two equations separately on distinct subsets of respondents:

a) Subsample: $T_{50} \cup T_{100}$

$$y_{i,j} = \alpha + \beta_{T_{50}} T_{50,i} + \mu_j + X_i\beta + \varepsilon_{i,j} \qquad \textbf{(Eq. 2)}$$

In this equation, the parameter of interest is $\beta_{T_{50}}$, which captures differences between eligible girls in the mixed group and in the full treatment group. This coefficient thus captures possible *undermining* effects which may occur if changes in treatment girls' life trajectories are hindered by the fact that the life of non-treated peers does not change in mixed group villages.

b) Subsample: $C_{50} \cup C_{100}$

$$y_{i,j} = \alpha + \beta_{C_{50}} C_{50,i} + \mu_j + X_i\beta + \varepsilon_{i,j} \qquad \textbf{(Eq. 3)}$$

In this equation, the parameter of interest is $\beta_{C_{50}}$, which captures differences between non-treated girls in the mixed group and in the pure control group. This coefficient thus captures possible (positive) *snowball* effects or (negative) *displacement* effects which may occur if non-treated eligible girls are influenced by changes in treatment girls' life trajectories in mixed group villages.

Finally, we measure another type of possible *displacement* effect which may occur at the expense of ineligible girls. More specifically, we investigate whether the intervention had any impact on non-treated girls in treatment households and villages. To do so, we restrict our focus to sisters and any adolescent girls living in $T_{100} \cup C_{100}$ and estimate equation 1 displayed above.

In all estimations, we cluster standard errors at the village level to take into account possible correlations in outcomes within villages. To control for Family-Wise Error Rates (FWER) among primary outcomes, we also compute Romano Wolf stepdown adjusted p-values, which allow for dependence between p-values by bootstrap resampling (Romano and Wolf, 2005a; Romano and Wolf, 2005b).

4. Data and sample characteristics

4.1. Data sources and sample

We conducted a baseline survey in January 2018, just a month after we received the list of eligible girls from the Ministry of Education. As part of this first round of data collection, we collected information from eligible girls and the head of their household. In total, out of the 2,360 girls identified as eligible, we were able to locate and interview 2,272, as well as 2,221 household heads.[17]

In August 2020, a few months after the last payment of the scholarship was made, we carried out a follow-up survey. We collected information from girls, their mother, and the head of their household. The girl questionnaire collected information on their level of education, marital status, fertility, aspirations, and gender-related opinions. Mothers were asked about their educational, work-related and family-related aspirations for each of their children. The household head questionnaire collected information on each household member (including ineligible girls), in particular their level of education and marital status.

As part of the follow-up survey, we were able to successfully survey 89 percent of the 2,272 eligible girls and 94 percent of the 2,221 household heads included in our sample. Attrition among eligible girls is slightly differential, as shown in the first row of Table 1: the attrition rate is 4 percentage points lower in full treatment villages (T_{100}) than in pure control villages (C_{100}) (the difference being significant at the 5 percent level). With a few exceptions, attrition is due to the fact that interviewers were unable to locate girls and households in the sample. Still, Table 1 shows that this differential attrition rate is too small to affect the comparability of the two groups in terms of baseline observable characteristics. We also calculate Lee bounds (Lee, 2009) for each of our main

[17] To be exact, 2,145 heads of household and 76 other adults in cases where the head of the household was not available. For the sake of simplicity, we refer to adult members of the household originally surveyed as household heads.

results and show that they cannot be explained by differential attrition (displayed in the appendix). Table 2 shows that attrition among household heads is not differential between T_{100} and C_{100} and the two groups remain statistically comparable at endline.

4.2. Sample characteristics

Table 1 presents the baseline characteristics of the girls who responded to both the baseline and endline surveys, who are the ones included in the analysis. At baseline, girls were 13.3 years old on average, with 83 percent between 12 and 14 years of age. The average GPA was 5.6 on a scale from 0 to 10, which indicates that baseline academic profiles were rather average at the end of primary school. It is interesting to note that girls' educational aspirations at baseline were quite high, as 27 percent aspired to attend high school and 58 percent to attend higher education.

Almost none of the girls (1 percent) had been married at baseline, and 5 percent of them were promised. They reported an ideal age for marriage of 18.4, which is well above the actual age since 76 percent of Nigerien women marry before age 18 (UNDP, 2019). However, for 44 percent of the girls, getting married before the age of 18 does have advantages. In their view, it makes it easier to find a husband and have children, underlying the importance of conservative gender norms.

Regarding children, girls considered the ideal age for having their first child to be 20.6 years of age on average, well above the actual average age at which women actually have their first child in Niger, which is 18.6.[18] In contrast, the reported ideal number of children is in line with the actual fertility rate: girls in our sample wanted 7.1 children on average, when Niger's actual fertility rate

[18] This is according to the latest available data. Indeed, in 2012, it was estimated that the median age at which women aged 25-49 had their first child was 18.6 years (2.9 years past the age of first union) (INS Niger and ICF International, 2013).

was 7 births per woman in 2017.[19] The data also shows that 58 percent of the girls knew at least one contraceptive method and 24 percent knew where to get a contraceptive method.

Finally, consistent with the program's objective, girls come from disadvantaged families. As displayed in Table 2, the household head's level of education is very low: 72 percent never went to school, and 24 percent did not go beyond primary school. Dwelling characteristics are typical of poor rural areas: 48 percent of households live in a dwelling with mud walls, 27 percent have stone walls, and 12 percent have walls made of wood or straw. Only 13 percent of households own a television set.

4.3. Outcomes of interest

Primary outcomes[20]

Our first set of primary outcomes are girls' life outcomes: educational outcomes, marriage and fertility outcomes, and welfare outcomes. With this in mind, girls' endline questionnaire provides information on their enrollment status, grade level, number of months spent in school since the baseline questionnaire, whether they are married or promised, whether they have ever been pregnant, their level of life satisfaction on a 10-point Likert scale, and their level of happiness on a 4-point Likert scale.

Our second set of primary outcomes are girls' education-, work-, and family-related aspirations and the aspirations their parents have for them. With respect to girls' aspirations, we measure

[19] As per the United Nations Population Division. Statistics on the fertility rate in Niger can be found here: https://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=NE (last accessed in February 2022)

[20] Pre-registered primary outcomes are education, marital status, number of children, and women empowerment. Registration was done in June 2019 before follow-up data collection began (AEARCTR-0003296). In this paper, we retained three of these primary outcomes (education, marital status, and number of children), replaced women empowerment with well-being, which we felt was more general and relevant in the short term given that the share of married girls is relatively low at follow-up and not equal across treatment groups, and added a set of variables related to aspirations.

educational aspirations using dummies indicating whether the girl wishes to attend high school / to complete high school / to pursue higher education. We also measure professional aspirations using dummies indicating whether the girl wants to work outside the home in non-family activities before getting married / once married with young children / once her children are grown up, her expected monthly income, and whether she wants a traditional occupation (*e.g.*, agricultural work or domestic work) or a modern occupation (*e.g.*, administrative, intellectual, or managerial profession). We measure family-related aspirations using dummies indicating whether the girl wants to get married / have children and, if so, at what age. We proxy parents' aspirations by those of mothers and measure educational aspirations using dummies indicating whether mothers want their daughter to reach high school / pursue higher education. Work-related aspirations are measured using dummies capturing whether parents would like their daughter to hold a modern or a traditional occupation, and family-related aspirations are captured by the age at which they would like their daughter to get married.[21]

Outcomes to study the mechanisms at play

To understand the mechanisms at play, we study a set of secondary outcomes that we separate into two groups: those related to the girls' human capital, and those related to their preferences (opinions and values). Our theory of change posits that, if any changes in life outcomes are found, they can result from an incapacitation effect, an increase in human capital (the human capital theory), and/or a change in preferences (the modernization theory). In contrast, changes in educational, occupational, and family aspirations can theoretically result only from a change in human capital or a change in preferences – but not from an incapacitation effect, which by definition can have no such impact.

[21] For the subset of girls who were already married at endline, the variable indicates the age at which these girls married. For this subset of daughters, we therefore consider that mothers' aspirations have been met.

To investigate the importance of the human capital theory, we construct summary indices capturing girls' human capital in three different domains. The first area of focus is academic skills, which are captured using a literacy index, a numeracy index, and an overall index aggregating both, all based on standardized tests. The second area of interest is psychosocial skills, which are captured using standard psychometric scales designed to measure problem-solving, perseverance, self-awareness, interpersonal skills, self-efficacy, and creativity. We also construct an overall psychosocial skills index aggregating these six dimensions. Finally, the third domain of interest is knowledge on sexual and reproductive health. We asked six questions to assess girls' knowledge on pregnancy and delivery (pre- and post-natal care services), 13 questions on contraceptive methods, and eight questions on HIV transmission and prevention. We also construct an overall sexual and reproductive health (SHR) knowledge index aggregating these three dimensions.

To investigate the importance of the modernization theory, we study girls' preferences (opinions and values) in various areas. More specifically, we focus on the opinions and values of girls which, at first glance, can be considered independent of their own level of human capital to assess the effects of changes in preferences independently of the effects of changes in human capital. First, we asked them what they thought was the ideal age to get married for a woman and for a man, and whether they saw disadvantages to getting married and having children before 18, in general (not for themselves). Second, we measured opinions on gender equality. We asked seven questions on whether men or women, or both, should be responsible for different tasks (such as earning money or feeding and bathing children), and then built a gender-related opinions index aggregating these seven opinions. We also asked girls what would be the ideal level of education for their sons and daughters, and whether they thought sons and daughters should ideally work. Finally, we measured opinions on domestic violence. We asked six questions on whether beating one's wife is justified under certain

circumstances, such as if she is neglecting the children or refusing to have sex with her husband, and then built a domestic violence opinions index aggregating the answers to these six questions.

All indices mentioned above are constructed using the same aggregation method: each index is constructed as a weighted mean of the standardized components. The signs are reversed if necessary, so that an increase in the value taken by a variable always indicates welfare gains, and all components are demeaned and divided by the standard deviation of the control group. We weight each component using the methodology proposed in Anderson (2008), which ensures that components that are highly correlated with each other receive less weight, while components that are less correlated with other components, and therefore represent new information, receive more weight. In what follows, we focus on the results obtained on the summary indices, rather than those obtained on the individual variables composing the indices, in order to avoid inference problems due to multiple hypothesis testing.

5. Direct impacts

We first report the impact of the intervention on eligible girls by comparing the full treatment group T_{100} and the pure control group C_{100}.

5.1. Life outcomes

Education

Table 3 Panel A presents the impacts on education outcomes. The intervention had a large and positive effect on the probability of being enrolled in school at endline, *i.e.*, three years after the beginning of the intervention: the dropout rate in the treatment group is reduced by half in the control group, with a drop from 40 down to 19 percent. This finding shows that education uptake is sensitive to price (which includes the direct and opportunity costs of education), and that scholarships conditional 'only' on registration are very effective at reducing dropouts.

While girls should have completed Grade 8 at endline if they did not repeat a class, we find that, in the control group, only 30 percent actually completed Grade 8, while 20 percent completed Grade 7 and 6 percent Grade 6 (as discussed above, another 40% dropped out, and the information is missing for the remaining 4 percent). This is not particularly surprising given how frequent class repetition is in Niger. Interestingly, the intervention increased the probability of having completed Grade 7 by 20 percentage points. In contrast, we find a non-significant 5-percentage point increase in the probability of having completed Grade 8[22]. This suggests that the intervention helped maintain in school girls who had been asked to repeat a grade, while more proficient girls who were on schedule would have remained enrolled even in the absence of the scholarship. As a consequence, the intervention increased the average number of months girls have spent in school by about 3 months over the previous three academic years.[23]

In Figure 2 we characterize compliers with treatment assignment by the ratio of the first stage effect, using the dummy "still at school at endline" as outcome, within specific sub-samples to the overall first stage (Angrist et al., 2016). Compliers are younger, more likely to be from the bottom part of the initial academic performance distribution, more likely to aspire to attain high school at baseline, and more likely to consider that it is better to get married before 18 at baseline. It is interesting that girls who are more conservative about marriage and less performant at school respond more since they are probably more vulnerable to child marriage. Figure 3 provides additional evidence on the timing of the effect on dropouts. To do so, we use girls' dropout date reported at endline (if any). We see that, in the control group, the largest increase in dropouts happened at the end of Grade 6, in June 2018, which corresponds to the time when girls were informed of whether

[22] The difference in the impact of the intervention on the proportion of girls enrolled in 7th grade and the proportion of girls enrolled in 8th grade is statistically significant.at the 1% level (p-value=0.008).

[23] We investigate whether this impact is due to the fact that more girls are enrolled in school (the extensive margin), or because enrolled girls spend more time in school (the intensive margin). We find no difference in months of education across treatment and control groups for girls still enrolled at endline (the point estimate is close to zero and not significant, results are not shown but are available upon request), which indicates that the increase in months of education is purely driven by the extensive margin.

they had to repeat Grade 6 or were accepted in Grade 7. Likewise, the second largest wave of dropouts happened at the end of Grade 7, in June 2019. The jumps in dropouts at the end of Grades 6 and 7 also exist in the treatment group, but they are much smaller in size than in the control group. The timing of the effect and the fact that compliers are mostly girls who repeated a grade suggest that the scholarship works as a defense against discouragement when girls are struggling in school.

Even if schooling is not the unique objective of the program (which is primarily child marriage and girl empowerment), we want to mention that the scholarship in Niger is not especially cost-effective in terms of years of schooling. The total cost is 2011 USD 705 per girl[24] for a benefit of 3.16 months of education, which represents 0.04 additional years of schooling per 2011 USD 100 spent. We should note that the implementation cost represents 20%, and the transfers 80%, of the cost of the program. The implementation cost is quite large due to the absence of infrastructure to make the payments to girls and hosting families. The NGO had to travel to each scattered school to bring the cash and check manually girls' enrollment status. Mobile money transfers and numerical school registers would lower the cost of the program by almost 20%.

Marriage

Table 3 Panel B presents the impacts of the intervention on the primary outcome: marital status. Quite strikingly, we find that the intervention halved the probability to be married at endline from 14 percent down to 7 percent. Figure 4 shows the impact on marriage by age at endline. We see that the reduction in marriage concerns primarily girls aged 17, 18 and 19 at endline. In fact, marriage remains quite infrequent up to 16 and increases sharply from 17 on. In order to assess the impact of the

[24] The cost of the program was provided by the ministry of women empowerment in Niger. We use 2019 FCFA-USD exchange rate to express the cost in 2019 USD, and then the inflation rates provided by the World Bank to translate 2019 USD into 2011 USD (https://data.worldbank.org/indicator/NY.GDP.DEFL.KD.ZG?locations=US). 2011 is used as base year in order to compare the cost-effectiveness of this program to those of other programs included in J-PAL analysis of the cost-effectiveness of education programs: Conducting cost-effectiveness analysis (CEA) | The Abdul Latif Jameel Poverty Action Lab.

program on *child* marri age, we use the age at which married girls have been married (Table 3, panel B). Among girls above 16 at endline, we see a small non-significant reduction of those who have been married before 16 (from 4 down to 2%). We can conclude that girls targeted by the program are not those who marry very early. Among girls above 17 and 18, we observe large reductions of those who have been married before 17 (from 11% down to 4%) and before 18 (from 21% down to 4%). The intervention had thus a large effect on marriage between 16 and 18. Moreover, the intervention also reduced the probability of being promised from 10 percent down to 7 percent. However, we find no significant decrease in the probability of having ever been pregnant. As this concerned only 3% of eligible girls in the control group, the margin of improvement over the study period is limited and a longer-term follow-up would be needed to better assess the impact of the intervention on this outcome.

Figure 5 provides additional evidence on the timing of the effects on marriage. To do so, we use girls' marriage date reported at endline (if any). Unlike what is observed with dropouts, there are no massive jumps in marriages but rather a continuous, marked increase throughout the period. Yet, in the control group, an acceleration in the marriage rate is observed from February 2019 (when girls were aged 14.5 on average), whereas the acceleration only started in April 2020 in the treatment group (when girls were above 15.5 on average). This 14-month delay in the marriage rate acceleration explains most of the marriage gap at endline. Another noticeable result is that the timing of dropouts does not closely follow the timing of marriages, since dropouts are bunched up at the end of school years and happen earlier than marriages.

Wellbeing

Finally, Panel C presents the impacts of the intervention on wellbeing. We find that the intervention induced an increase in life satisfaction of 25 percent of a standard deviation relative to

the control group. This represents a substantial welfare gain, which suggests that, during adolescence, remaining in middle school is beneficial for individual wellbeing, even for those who struggle in school and have to repeat a grade. Happiness is also higher in the treatment group, but the difference between groups is small (6 percent of a standard deviation) and non-significant. These findings indicate that the increased enrollment in middle school and decreased marriage rate come with welfare gains, a result which has been overlooked in the literature.

In Table A1 placed in the Appendix, we present Lee bounds for each of our main results and show that none of them can be explained by the small differential attrition discussed above.

To conclude, alleviating financial and logistical barriers for disadvantaged girls in rural Niger proved effective at increasing enrollment in middle school, reducing early marriage and improving their wellbeing. To assess the impacts of secondary education on compliers, we regress marriage, fertility, and wellbeing outcomes on girls' number of years of education and instrument this endogenous regressor by their assignment to treatment (Table 4). In doing so, we measure the local average treatment effect on girls for whom the elasticity of demand for education with respect to the scholarship is positive. Secondary education appears as a powerful shield against child marriage: an additional year spent in middle school translates into a 19-percentage point decrease in the probability of being married at follow-up and a 30-percentage point decrease in the probability of being married as a child (under 18 years old). It also induces an increase in life satisfaction of 75 percent of a standard deviation, which is a considerable impact.

5.2. Aspirations

Girls' aspirations

We begin by reporting on the impact of the intervention on girls' aspirations. Table 5 presents the impacts of the intervention on girls' educational, professional, and family-related aspirations. First, we find that the intervention boosted their educational aspirations. Indeed, it increased the share of girls who wish to attend high school (from 64 to 70 percent), to complete high school (from 60 to 68 percent), and to pursue higher education (from 30 to 46 percent) – the first two effects being statistically significant at the 10 percent level and the third one at the 1 percent level. Thus, the largest impact concerns aspirations for higher education, for which it represents a 53 percent increase at the control mean.

We also find some differences in girls' professional aspirations, although only marginally significant. We find no change on the extensive margin: about four in five girls wish to work outside of their home before and after marriage, with no difference between the treatment and control groups. Moreover, the probability of wishing to hold a traditional occupation (*e.g.*, agricultural work or domestic work) diminishes by 6 percentage points, whereas the probability of wishing to hold a modern occupation (*e.g.*, administrative, intellectual, or managerial profession) increases by 7 percentage points – representing a 9 percent increase at the control mean. It is interesting to note that, in the control group, girls have a strong preference for modern occupations over traditional ones (78 percent), which may explain why the magnitude of the effects on professional aspirations is smaller than on aspirations to pursue higher education. Third, we do find a marginally significant 15 percent increase in the expected monthly salary over the mean in the control group (20,460 XOF per month).

Finally, we also observe some changes in family aspirations. While virtually all girls in both the treatment and control groups aspire to get married and have children (95 percent of non-married

girls and 97 percent of non-mothers), we find that the intervention increased the age at which they would like to get married and have their first child, by 0.7 and 0.9 years respectively. In Figure 6, we show the distribution of responses in the pure control group and in the full treatment group. The largest effect is found on girls for whom the ideal age of marriage was between 16 and 19 – especially 17 and 18 –, whose aspiration evolves in favor of marrying at an older age, especially at 20. Since girls were 16 years old on average at endline, the bulk of the effect on early marriage may be larger two years later than what was observed at endline.

Mothers' aspirations

Next, Table 6 presents the impact of the intervention on the aspirations that mothers have for their daughter included in our sample. First, the intervention increased mothers' educational aspirations for their daughter. Although effect sizes are slightly smaller, the pattern of results is similar to that described above. The intervention increased the share of mothers who want their daughter to reach high school (from 46 to 51 percent), and the share who want their daughter to go to college (from 28 to 38 percent) – the second coefficient being statistically significant at the 5 percent level. Again, the largest impact is on aspirations for higher education, for which it represents a 36-percent increase at the control mean.

We also find differences in mothers' work-related aspirations for their daughter. Again, the effects indicate that the intervention increased aspirations for modern occupations. The share of mothers who want their daughter to have a modern occupation increased significantly from 73 to 86 percent – significant at the 1 percent level.

Finally, we also observe some changes in mothers' family-related aspirations for their daughter, also in line with the effects observed on girls' aspirations for themselves. We find that the intervention increased the age at which they would like their daughter to get married by 0.6 year. In Figure 7, we

show the distribution of responses in the pure control group and full treatment group. We observe that the share of mothers who want their daughter to marry between the ages of 14 and 18 is much lower in the treatment group than in the control group, and in particular a net decrease in the share of mothers who want their daughter to marry before their 17th birthday. This specific impact may contribute to explaining the net decrease in child marriage in the treatment group. This paper is the first to provide evidence that maternal preference for early marriage is malleable and can respond positively to financial support for their daughter's education, which contradicts the view that conservative gender norms are an insurmountable cultural obstacle to women empowerment.

Overall, the increase in middle school participation due to the intervention is associated with substantial changes in educational, professional, and family-related aspirations going in the direction of women empowerment. We see similar changes in daughters' aspirations for themselves and mothers' aspirations for their daughter. These results suggest that the effects of the intervention are likely to last beyond the mere duration of the scholarship.

5.3. Mechanisms

The changes in respondents' aspirations indicate that the impact of the intervention goes beyond a pure incapacitation effect, whereby the reduction in marriage would occur solely through a reduction in the time available to engage in courtship activities (which frequently occurs when girls are out hawking on behalf of their family). In what follows, we investigate whether these observed changes in aspirations and life outcomes can potentially be explained by increases in human capital, changes in preferences, or both.

Human capital

Table 7 presents the impacts of the intervention on girls' human capital. We examine skills that may be affected by the intervention (*i.e.*, by participating in middle school): academic skills, psychosocial skills, and knowledge about sexual and reproductive health. We consider these skills as outcomes in their own right, as well as potential mechanisms explaining the effects described above.

The intervention increased the girls' academic skills (Table 7, Panel A): we find a significant 0.18 standard deviations increase in the numeracy score, and a non-significant 0.09 standard deviations increase in the literacy score. Note that this effect is measured on all girls, regardless of whether or not they were still enrolled in school at the time of the follow-up survey. Table A2 (placed in the Appendix) presents a more in-depth analysis of academic skills. It reveals that literacy skills are particularly low: only 75 percent of girls in the control group can read letters, 41 percent can read words, 35 percent can read paragraphs, and 30 percent understand short stories. As in most former French colonies, the language of instruction used in school, which is French, is not the language spoken in households (only 20 percent of the population speaks French in Niger), which may partly explain literacy difficulties. Numeracy skills are better: 93 percent of control girls can count and identify numbers, 90 percent can compare numbers, 72 percent can do additions, 60 percent can do subtractions, 54 percent can do multiplications, and 47 percent can do divisions. The intervention increased the proportion of girls who can read letters by 15 points (significant at the 10 percent level), but not the other literacy tasks. In contrast, it increased the proportion of girls who can do additions (+ 20 points), subtractions (+15 points), multiplications (+17 points), and divisions (+15 points), resulting in a significant increase in the numeracy score. The overall academic score is 0.16 standard deviations higher in the treatment group relative to the control group – only statistically significant at the 10 percent level. IV estimates show that an additional year in middle school increases the overall

academic score by 0.41 standard deviation, significant at the 5 percent level,[25] which is smaller than what is usually found in the literature in developed countries.[26]

Beside academic skills, we find no significant impact of the intervention on psychosocial skills or knowledge about sexual and reproductive health (Table 7, Panels B and C). This finding indicates that the higher aspirations are *not* caused by an increase in self-efficacy, self-awareness, or any other behavioral skills associated with higher educational and professional ambition. Similarly, the older age at which girls want their first child is not related to improved knowledge of contraceptive methods and perinatal care.

To conclude, we find evidence that the intervention increased numeracy skills, which may have increased girls' opportunities on the job market and the opportunity cost of having children and, in doing so, may explain part of the effects observed on life outcomes and aspirations.

Preferences

Table 8 presents the impacts of the intervention on girls' preferences, *i.e.*, their opinions and values. We examine opinions related to women in general: marriage and fertility, gender equality, and domestic violence. Again, these opinions are outcomes in their own right as well as potential mechanisms for the changes in aspirations and life outcomes. Importantly, the questions were formulated in such a way that these opinions concern women in general, with minimal link to the girls' own level of human capital, the objective being to isolate a potential modernization of preferences from the human capital effect.

[25] Not shown, detailed results are available upon request.
[26] Education Endowment Foundation: https://educationendowmentfoundation.org.uk/public/files/Toolkit/Toolkit_Manual_2018.pdf

Overall, we find evidence of changes in some opinions, although not in all opinions tested. First, the intervention changed the reported ideal ages to get married, which increased from 18 to 18.5 years of age for women, and from 23.2 to 24 for men. Treatment girls are also 9 percentage points less likely to think that men should earn money for the family (off a basis of 80 percent in the control group). They also have higher educational aspirations for their children, both sons and daughters: the ideal number of years of education increased by 0.69 year for sons, and by 0.84 year for daughters.[27] Finally, they are 8 percentage points less likely to agree with the statement that beating one's wife is justified if she refuses to have sex with her husband (off a basis of 36 percent in the control group). We also observe a 0.13 standard deviations reduction in the acceptance of domestic violence index in the treatment group, but the standard error is 0.10 so the difference is not statistically significant.

Overall, these results provide evidence that secondary education changed some opinions held by the girls towards more modern preferences, supporting the idea that the modernization theory of education can also contribute to explaining some of the effects observed on life outcomes and aspirations. Finally, we would like to stress that IV estimates show that one additional year in middle school increases the ideal education length for one's daughter by 2.3 years.[28] The effect of subsidizing secondary education may thus well go beyond the private returns on current recipients by creating a dynamic of growing demand for education for future generations.

6. Externalities on other adolescent girls

We now turn to the analysis of possible externalities between treatment and non-treatment girls. Our design allows us to capture possible snowball or displacement effects, which may occur if non-treatment girls are influenced (positively or negatively) by changes in treatment girls' life trajectories,

[27] We consider that the higher demand for education for their future children primarily reflects an increased taste for education rather than a human capital effect.

[28] Not shown, detailed results are available upon request.

as well as undermining effects, which may occur if changes in treatment girls' life trajectories are limited by the fact that some of their peers are not receiving the intervention.

Table 9 shows the results for externalities between eligible girls, *i.e.*, girls all meeting the eligibility criteria for the scholarship. The first columns show the differences in life outcomes between non-treated girls in mixed villages (C_{50}) who were exposed to treated peers, and non-treated girls in pure control villages (C_{100}) who were not exposed to any treated peers. This comparison thus estimates the externalities going from treatment to non-treatment girls. Overall, differences are small and not statistically significant, suggesting no snowball or displacement effects on eligible non-treated girls. This implies both good and bad news: there is no detrimental effect on non-treated eligible girls, but the positive effects of the intervention are also limited to the direct effects on treatment girls.

Still, we should caveat our conclusion by pinpointing the fact that some results suggest that the intervention may have small externalities that we may not have the statistical power to detect. In particular, non-treated girls in mixed villages (C_{50}) are slightly less likely to be married at follow-up than non-treated girls in pure control villages (C_{100}) and report higher levels of life satisfaction. Symmetrically, treated girls in mixed villages (T_{50}) are slightly more likely to be married at follow-up than treated girls in full treatment villages (T_{100}) and report lower levels of life happiness. Although interesting, these results should be taken with caution since coefficients are at best only significant at the 10% level and do not survive a p-value adjustment to control for FWER. Future data collection may allow us to shed new light on this issue.

Finally, Table 10 provides evidence on externalities from treatment to non-eligible girls. For the sake of simplicity, we compare the situation in C_{100} and T_{100} villages. We focus on girls who live in the same household (typically sisters) and those living outside the household but in the same

village. Indeed, one concern is that the improvement of treatment girls' situation might happen at the expense of their sisters or other girls in the village: if treatment girls marry later, men may transfer their choice to other girls. Similarly, if eligible girls stay in school, other girls in their household may be forced to drop out to help with housework. To answer this question, household heads were asked about the marital status of girls aged 12-24 who were not married at baseline. They were also asked about the number of years of education for those girls. We do not find any detrimental effect of the intervention on the education or marriage of other girls in the household (Table 10, Panel A). We also asked mothers to provide the total number of girls who had gotten married in their family and among their friends and relations in the past 12 months. Eligible girls are not included in the calculation of the total number of girls who got married to capture potential displacement effects. Again, we find no difference in the number of marriages of other girls among treatment girls' relations between the control and treatment groups, which reinforces the evidence of there being no displacement effect.

7. Conclusion

While child marriage is recognized as a major burden in developing countries, and especially in West Africa, few studies have identified effective policy responses. Using a randomized controlled trial, we show that a three-year intervention eliminating the financial and logistical barriers for girls admitted to middle school halves the probability of both dropping out of school and getting married, and improves life satisfaction. Importantly, girls who were offered the scholarship also show higher educational and professional ambitions, as do their mothers for them, which suggests that the effects of the scholarship may extend beyond the duration of the intervention. These changes may be explained by the observed higher academic skills, as well as by more modern opinions related to marriage, fertility, and education, on top of a potential incapacitation effect which may also co-exist but cannot be isolated. Finally, this paper shows that this program does not generate externalities

between treatment and non-treatment adolescent girls. In particular, the positive impact on treatment girls does not come at the cost of lower education or earlier marriage for non-treatment girls living in the same households or villages. This result allows us to conclude that, even in contexts of extremely low women empowerment and conservative social norms like Niger, offering scholarship to girls starting middle school has unambiguously large and positive effects at both the individual and the community levels.

This paper opens up new questions, especially regarding the population to whom this intervention should be extended. As we find stronger impact on less proficient adolescent girls, further research should investigate the possible extension of the scholarship program to a wider population of girls, even lower-performing than those included in this study. Furthermore, another version of this policy could focus on urban areas, where the direct and opportunity costs of education may still be a binding constraint even if geographical access is less of a concern. Finally, similar scholarship programs should be tested in other countries where, as in Niger, early marriage is pervasive and secondary school enrollment for girls is low.

References

Akresh, R., de Walque, D. & Kazianga, H. (2013). Cash Transfers and Child Schooling: Evidence from a Randomized Evaluation of the Role of Conditionality. World Bank Policy Research Working Paper No. 6340.

Alam, A., Baez, J. E., & Del Carpio, X. V. (2011). Does cash for school influence young women's behavior in the longer term? Evidence from Pakistan. Evidence from Pakistan (May 1, 2011). World Bank Policy Research Working Paper, (5669).

Anderson, M. L. (2008). Multiple inference and gender differences in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects. *Journal of the American statistical Association*, *103*(484), 1481-1495.

Angrist, J., Bettinger, E., Bloom, E., King, E., & Kremer, M. (2002). Vouchers for private schooling in Colombia: Evidence from a randomized natural experiment. *American Economic Review*, *92*(5), 1535-1558.

Angrist, J. D., Cohodes, S. R., Dynarski, S. M., Pathak, P. A., and Walters, C. R. (2016). Stand and deliver: Effects of Boston's charter high schools on college preparation, entry, and choice. *Journal of Labor Economics*, 34(1), 275–318.

Ashraf, N., Field, E., & Lee, J. (2014). Household bargaining and excess fertility: an experimental study in Zambia. *American Economic Review*, *104*(7), 2210-37.

Baez, J. E., & Camacho, A. (2011). Assessing the long-term effects of conditional cash transfers on human capital: evidence from Colombia. World Bank Policy Research Working Paper, (5681).

Baird, S., McIntosh, C., & Özler, B. (2011). Cash or condition? Evidence from a cash transfer experiment. *The Quarterly journal of economics*, *126*(4), 1709-1753.

Baird, S., Bohren, J. A., McIntosh, C., & Özler, B. (2018). Optimal design of experiments in the presence of interference. *Review of Economics and Statistics*, *100*(5), 844-860.

Barrera-Osorio, F., Bertrand, M., Linden, L. L., & Perez-Calle, F. (2011). Improving the design of conditional transfer programs: Evidence from a randomized education experiment in Colombia. *American Economic Journal: Applied Economics*, *3*(2), 167-95.

Belloni, A., Chernozhukov, V. and Hansen, C. (2014). Inference on treatment effects after selection among high-dimensional controls. *The Review of Economic Studies*, *81*(2), pp.608-650.

Benhassine, N., Devoto, F., Duflo, E., Dupas, P., & Pouliquen, V. (2015). Turning a shove into a nudge? A" labeled cash transfer" for education. *American Economic Journal: Economic Policy*, *7*(3), 86-125.

Black, S. E., Devereux, P. J., & Salvanes, K. G. (2008). Staying in the classroom and out of the maternity ward? The effect of compulsory schooling laws on teenage births. *The economic journal*, 118(530), 1025-1054.

Blimpo, M., Gajigo O., & Pugatch, T. (2019). Financial Constraints and Girls' Secondary Education: Evidence from School Fee Elimination in The Gambia. *The World Bank Economic Review*, *33* (1): 185–208.

Bobonis, G. J., & Finan, F. (2009). Neighborhood peer effects in secondary school enrollment decisions. *The Review of Economics and Statistics*, *91*(4), 695-716.

Brudevold-Newman, A. (2021). Expanding access to secondary education: Evidence from a fee reduction and capacity expansion policy in kenya. *Economics of Education Review*, *83*, 102127.

Chari, A. V., Heath, R., Maertens, A., & Fatima, F. (2017). The causal effect of maternal age at marriage on child wellbeing: Evidence from India. *Journal of Development Economics*, *127*, 42-55.

Chaudhury, N., & Parajuli, D. (2010). Conditional cash transfers and female schooling: the impact of the female school stipend programme on public school enrolments in Punjab, Pakistan. *Applied Economics*, 42(28), 3565-3583.

Crépon, B., Duflo, E., Gurgand, M., Rathelot, R., & Zamora, P. (2013). Do labor market policies have displacement effects? Evidence from a clustered randomized experiment. *The quarterly journal of economics*, *128*(2), 531-580.

Diarra, A. (2019). Lutter contre les mariages précoces par l'autonomisation des filles. Etudes et Travaux du LASDEL, n° 126.

Duflo, E., Dupas, P., & Kremer, M. (2015). Education, HIV, and early fertility: Experimental evidence from Kenya. *American Economic Review*, *105*(9), 2757-97.

Duflo, E., Dupas, P., & Kremer, M. (2021). The Impact of Free Secondary Education: Experimental Evidence from Ghana. Working Paper.

Ferré, C. (2009). Age at first child: does education delay fertility timing? The case of Kenya. The Case of Kenya (February 1, 2009). World Bank Policy Research Working Paper, (4833).

Field, E., & Ambrus, A. (2008). Early marriage, age of menarche, and female schooling attainment in Bangladesh. *Journal of Political Economy*, *116*(5), 881-930.

Friedman, W., Kremer, M., Miguel, E., & Thornton, R. (2016). Education as Liberation? *Economica*, *83*(329), 1-30.

Filmer, D., & Schady, N. (2014). The Medium-Term Effects of Scholarships in a Low-Income Country. *Journal of Human Resources*, *49*(3), 663-694.

Giordono, L., & Pugatch, T. (2017). Non-Tuition Costs, School Access and Student Performance: Evidence from the Gambia. *Journal of African Economies*, *26*(2), 140-168.

Glewwe, P., & Kassouf, A. L. (2012). The impact of the Bolsa Escola/Familia conditional cash transfer program on enrollment, dropout rates and grade promotion in Brazil. *Journal of development Economics*, 97(2), 505-517.

Gulesci, S., Meyersson, E., & Trommlerová, S. K. (2020). The effect of compulsory schooling expansion on mothers' attitudes toward domestic violence in Turkey. *The World Bank Economic Review*, *34*(2), 464-484.

Hicks, J., & Hicks, D. L. (2019). Lucky Late Bloomers? Consequences of Delayed Marriage for Women in Rural Western Kenya. June 2019.

INS Niger and ICF International (2013). Niger Enquête Démographique et de Santé et à Indicateurs Multiples (EDSN-MICS IV) 2012. Calverton, Maryland, USA: INS/Niger and ICF International.

Jensen, R., & Thornton, R. (2003). Early female marriage in the developing world. *Gender & Development*, *11*(2), 9-19.

Lalive, R., & Cattaneo, M. A. (2009). Social interactions and schooling decisions. *The Review of Economics and Statistics*, *91*(3), 457-477.

Lee, D. S. (2009). Training, wages, and sample selection: Estimating sharp bounds on treatment effects. *The Review of Economic Studies*, 76(3), 1071-1102.

Maswikwa, B., Richter, L., Kaufman, J., & Nandi, A. (2015). Minimum marriage age laws and the prevalence of child marriage and adolescent birth: evidence from sub-Saharan Africa. *International perspectives on sexual and reproductive health*, *41*(2), 58-68.

Ozier, O. (2018). The Impact of Secondary Schooling in Kenya: A Regression Discontinuity Analysis. *Journal of Human Resources*, *53*(1), 157-188.

Perlman, D., Adamu, F., & Wodon, Q. (2018). Why do adolescent girls drop out of school in Niger? A combined quantitative and qualitative analysis. *Marché et organisations*, (2), 179-194.

Raj, A. (2010). When the mother is a child: the impact of child marriage on the health and human rights of girls. *Archives of disease in childhood*, *95*(11), 931-935.

Romano, J. P., & Wolf, M. (2005). Exact and approximate stepdown methods for multiple hypothesis testing. *Journal of the American Statistical Association*, 100(469), 94-108.

Romano, J. P., & Wolf, M. (2005). Stepwise multiple testing as formalized data snooping. *Econometrica*, 73(4), 1237-1282.

Schultz, T. P. (2004). School subsidies for the poor: evaluating the Mexican Progresa poverty program. *Journal of development Economics*, 74(1), 199-250.

Sunder, N. (2019). Marriage age, social status, and intergenerational effects in Uganda. *Demography*, *56*(6), 2123-2146.

UNICEF. (2018). Child marriage: Latest trends and future prospects. New York: UNICEF.

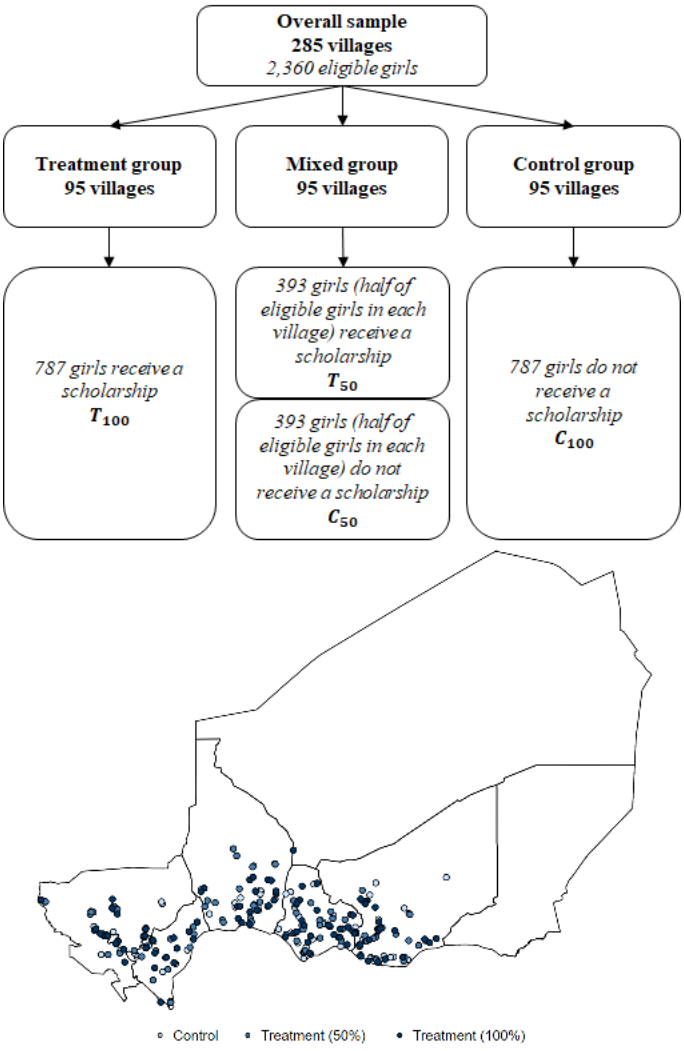
UNICEF (2019). The State of the World's Children 2019. Children, Food and Nutrition: Growing well in a changing world. UNICEF, New York

UNDP, H. (2019). Human Development Report 2019. Beyond income, beyond averages, beyond today: Inequalities in human development in the 21st century.

Wilson, N. (2021). Child Marriage Bans and Female Schooling and Labor Market Outcomes: Evidence from Natural Experiments in 17 Low-and Middle-Income Countries. *American Economic Journal: Economic Policy*.

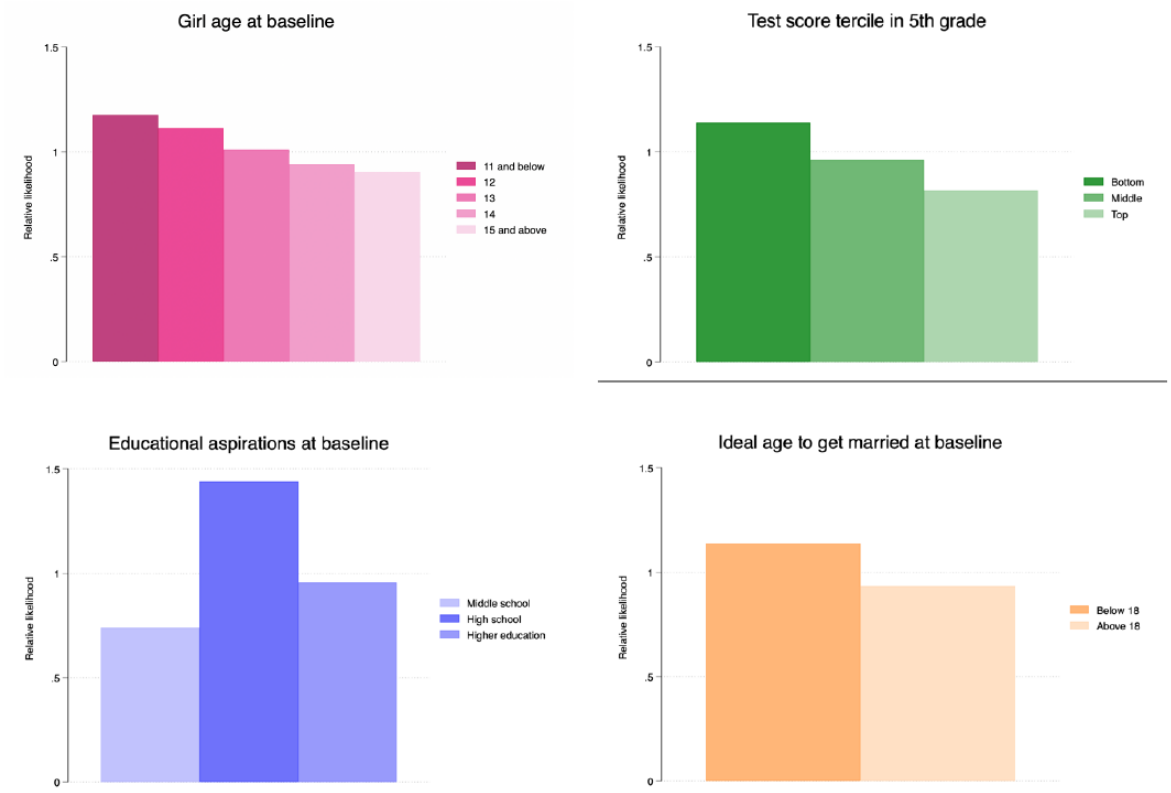
Figures

Figure 1: Experimental design and location of sampled villages



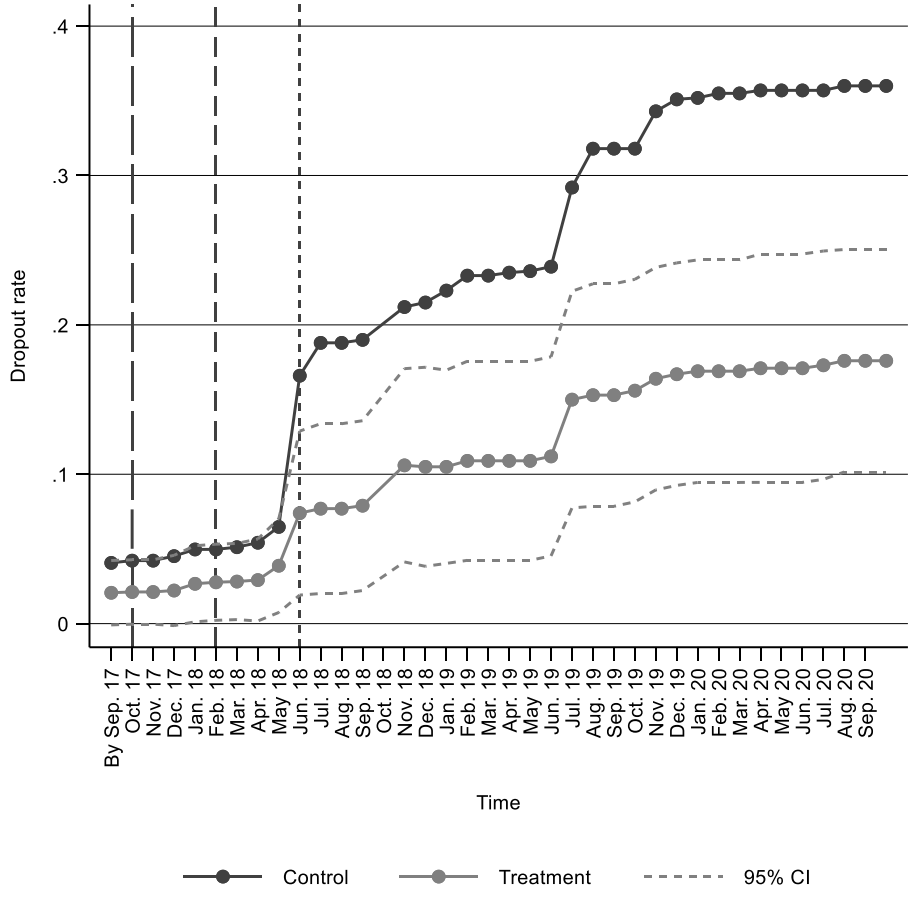
Notes: The study covers five of the country's seven regions: Dosso, Maradi, Tahoua, Tillabéry, and Zinder. Only two regions, Agadez and Diffa, were excluded from the study, the former because its fertility rate is lower than in the rest of the country and the latter for security reasons. First, villages were randomly divided into three equal-size groups. Then, in each village in the mixed group, half of the eligible girls were randomly selected to benefit from the intervention.

Figure 2: Compliers characteristics ratios (outcome: still enrolled at endline)



Note: This table report compliers characteristics ratios, that is, the ratio of the first stage for girls in a given category to the overall first stage. We consider as compliers girls who were still enrolled in school at endline. We display the relative likelihood of compliers' age range, test score tercile in 5th grade, level of educational aspiration at baseline and ideal age to get married at baseline

Figure 3: Timing of the impact on dropouts



Notes: This figure depicts the impact of the intervention on girls' dropout rate, which is measured every month from the intervention start date (using information about the date of their dropout). To do so, we represent the dropout rates in the control group (in black) and in the treatment group (in grey). We measure dropout rates in the treatment group by estimating equation (1) for each month. The dashed lines on each side of the dropout rate estimate in the treatment group represent the 95 percent confidence interval. The first vertical dotted line indicates the beginning of the 2017/2018 school year. The second vertical dotted line indicates the date when respondents were informed of whether they would receive the intervention. The third vertical dotted line indicates the date of the first scholarship disbursement and the end of the 2017/2018 school year. This graph is constructed from information collected at follow-up on respondents' enrollment status and, where applicable, their dropout date. That information on the date of dropout is missing for 29 observations.

Figure 4: Impact of the intervention on marriage, by age

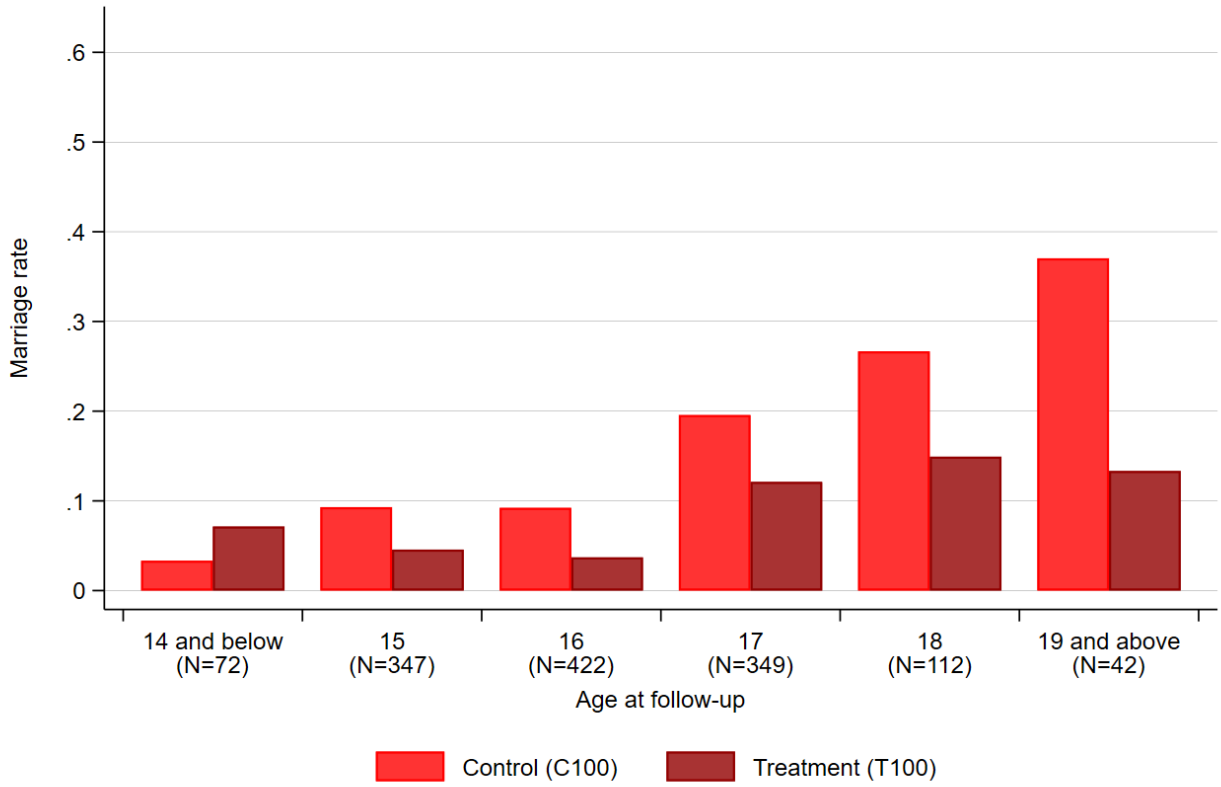
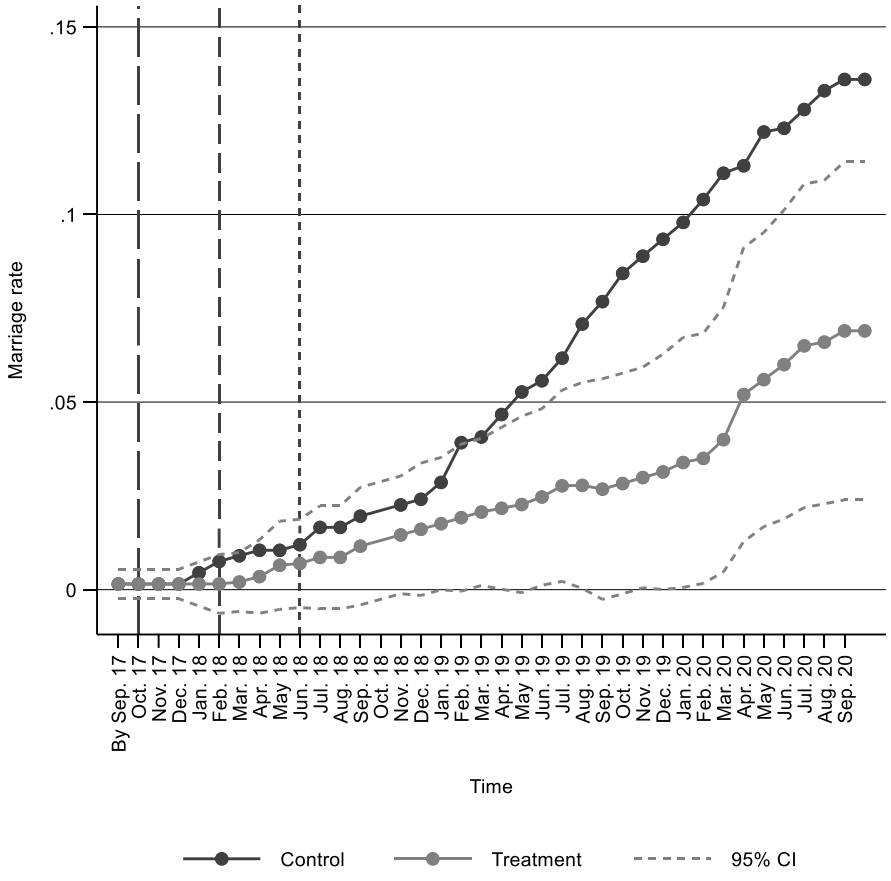
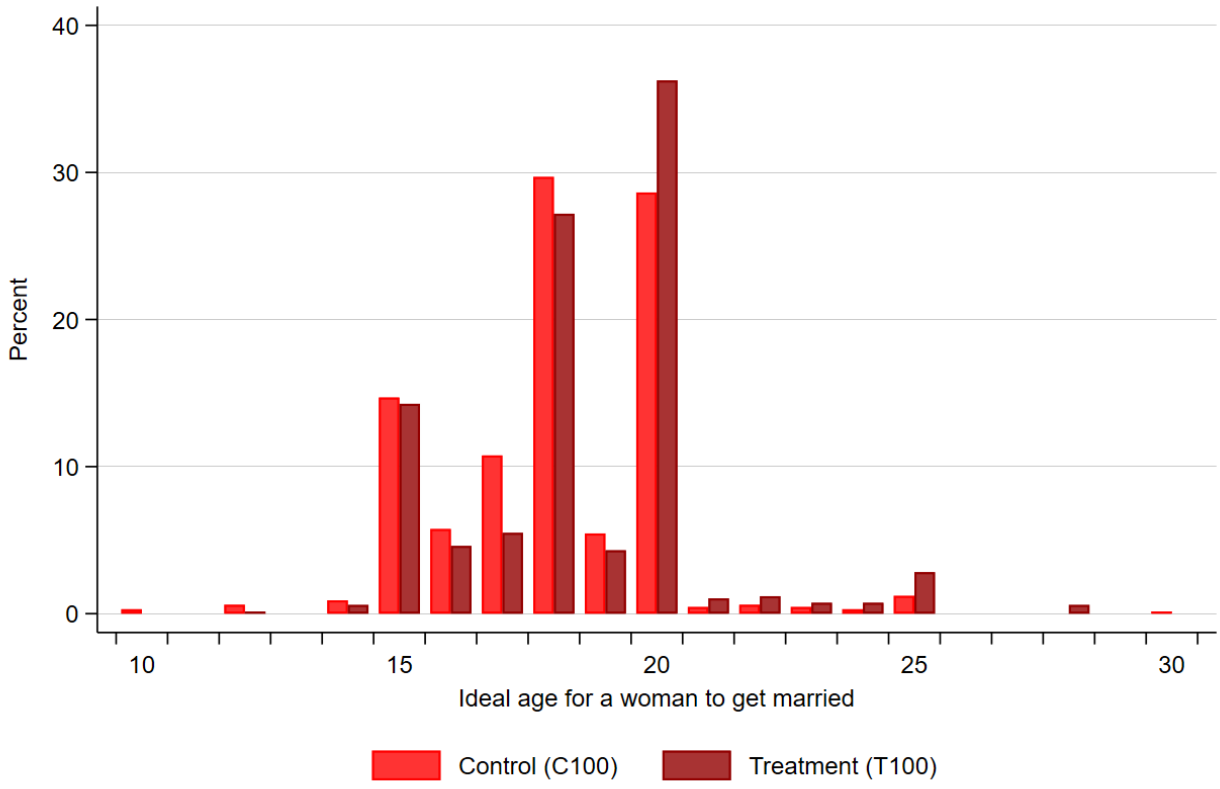


Figure 5: Timing of the impact on marriage



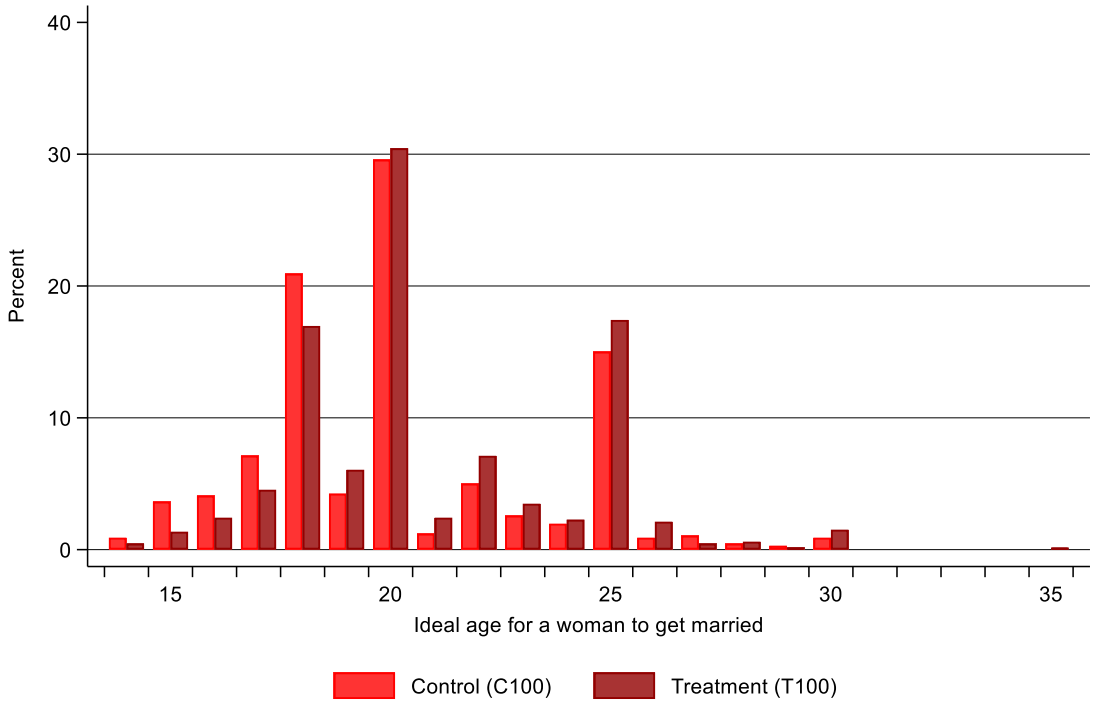
Notes: This figure depicts the impact of the intervention on girls' marriage rate, which is measured every month from the intervention start date (using information about the date of their first marriage). To do so, we represent the marriage rates in the control group (in black) and in the treatment group (in grey). We measure marriage rates in the treatment group by estimating equation (1) for each month. The dashed lines on each side of the marriage rate estimate in the treatment group represent the 95 percent confidence interval. The first vertical dotted line indicates the beginning of the 2017/2018 school year. The second vertical dotted line indicates the moment when respondents were informed of whether or not they would receive the intervention. The third vertical dotted line indicates the date of the first scholarship disbursement. This graph is constructed from information collected at follow-up on respondents' marital status and, where applicable, the date of their marriage. Note that information on the date of marriage is missing for 4 observations.

Figure 6: Impact of the intervention on girls' ideal age of marriage



Notes: This figure depicts the impact of the intervention on girls' ideal age of marriage. In the pure control group, 11 percent of girls report that the ideal age of marriage is 17, against 5 percent in the full treatment group.

Figure 7: Impact of the intervention on the age at which parents want their daughter to marry



Notes: This figure depicts the impact of the intervention on the age at which parents want their daughter to marry. In the pure control group, 7 percent of parents report that they wish for their daughter to marry at age 17, against 5 percent in the full treatment group.

Tables

Table 1: Baseline characteristics of the girls included in the endline sample

	Sample description		***Balance checks*** T_{100}-C_{100}	
	# Obs	Mean (s.d.)	Diff. (s.e.)	Sig.
Attrition girl survey	1,501	0.10	-0.04	**
		(0.31)	(0.02)	
Age	1,343	13.31	-0.06	
		(1.22)	(0.10)	
Aged 12	1,343	0.22	0.05	
		(0.41)	(0.03)	
Aged 13	1,343	0.35	-0.04	
		(0.48)	(0.03)	
Aged 14	1,343	0.25	-0.05	
		(0.43)	(0.03)	
Primary education GPA	1,120	5.64	0.04	
		(1.20)	(0.14)	
Educational aspirations				
Primary school	1,344	0.01	0.00	
		(0.08)	(0.00)	
Middle school	1,344	0.15	0.00	
		(0.36)	(0.03)	
High school	1,344	0.27	-0.05	
		(0.44)	(0.03)	
Higher education	1,344	0.58	0.05	
		(0.49)	(0.04)	
Ever married	1,344	0.01	0.00	
		(0.07)	(0.01)	
Promised in marriage	1,344	0.05	0.00	
		(0.22)	(0.02)	
Ideal age for marriage	1,344	18.44	0.06	
		(2.89)	(0.18)	
Ideal number of children	1,344	7.24	-0.06	
		(3.13)	(0.23)	
Any advantages to getting married before 18	1,344	0.44	-0.04	
		(0.50)	(0.04)	
Ideal age for a first child	1,314	20.61	0.34	
		(3.15)	(0.22)	
Knows at least one method of contraception	1,344	0.58	-0.04	
		(0.49)	(0.05)	
Knows a place to get a family planning method	1,344	0.24	0.06	
		(0.43)	(0.04)	

Notes: In this table, we provide the average characteristics of respondents who completed the endline questionnaire and test whether the attrition induced any imbalance between groups of respondents. We focus on respondents from the pure control group (C100) and full treatment group (T100). We regressed each variable displayed in the left column on a dummy variable taking the value 1 if girl *i* was offered a scholarship, i.e., lives in a treatment village, and region fixed effects.
Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 2: Baseline characteristics of the households included in the endline sample

	Sample description		*Balance checks* T_{100}-C_{100}	
	# Obs	Mean (s.d.)	Diff. (s.e.)	Sig.
Attrition household survey	1,461	0.07	0.00	
		(0.25)	(0.02)	
Household head characteristics				
Man	1,363	0.80	0.02	
		(0.40)	(0.03)	
Age	1,316	49.70	-0.99	
		(12.24)	(0.74)	
Highest educational attainment				
None	1,363	0.72	0.04	
		(0.45)	(0.03)	
Primary	1,363	0.24	-0.03	
		(0.43)	(0.03)	
Marital Status				
Monogamous marriage	1,363	0.52	0.00	
		(0.50)	(0.03)	
Polygamous marriage	1,363	0.38	0.01	
		(0.48)	(0.03)	
Other	1,363	0.07	-0.01	
		(0.25)	(0.01)	
Muslim	1,363	0.97	0.01	
		(0.18)	(0.01)	
Household characteristics				
Household size	1,363	8.56	-0.13	
		(4.17)	(0.31)	
Ethnic group				
Djerma/Songhai	1,363	0.21	0.01	
		(0.41)	(0.03)	
Hausa	1,363	0.60	0.00	
		(0.49)	(0.04)	
Peul	1,363	0.05	0.03	
		(0.22)	(0.02)	
Touareg	1,363	0.07	-0.02	
		(0.26)	(0.02)	
Other	1,363	0.03	0.00	
		(0.17)	(0.02)	
Wall material of the dwelling				
Mud	1,363	0.48	-0.02	
		(0.50)	(0.05)	
Wood/Straw	1,363	0.12	0.01	
		(0.33)	(0.03)	
Stones	1,363	0.27	0.03	
		(0.45)	(0.04)	
Bricks	1,363	0.06	-0.02	
		(0.24)	(0.02)	
Cement/Concrete	1,363	0.05	0.00	
		(0.21)	(0.02)	
Other	1,363	0.02	-0.01	
		(0.12)	(0.01)	
Owns a radio	1,363	0.41	-0.01	
		(0.49)	(0.03)	
Owns a TV	1,363	0.13	-0.01	
		(0.34)	(0.03)	
Asset ownership index	1,363	-0.01	0.00	
		(0.34)	(0.02)	

Notes: In this table, we provide the average characteristics of respondents who completed the endline questionnaire and test whether the attrition induced any imbalance between groups of respondents. We focus on respondents from the pure control group (C100) and full treatment group (T100). We regressed each variable displayed in the left column on a dummy variable taking the value 1 if girl *i* was offered a scholarship, i.e., lives in a treatment village, and region fixed effects.

Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 3: Impact on life outcomes

		C_{100}	T_{100}-C_{100}				P-values	
		(1)	(2)		(3)		(4)	(5)
	# Obs	Mean (s.d.)	Diff. (s.e.)	Sig.	Diff. (s.e.)	Sig.	Uncorr. p-values	RW p-values
Panel A: Education								
Dropped out	1,344	0.40	-0.21	***	-0.21	***	0.00	0.00
		(0.49)	(0.04)		(0.04)			
Enrolled in:								
Grade 6	1,315	0.06	-0.02		-0.02		0.22	0.42
		(0.24)	(0.02)		(0.02)			
Grade 7	1,315	0.21	0.20	***	0.20	***	0.00	0.00
		(0.41)	(0.04)		(0.04)			
Grade 8 & above	1,315	0.31	0.04		0.05		0.19	0.42
		(0.46)	(0.04)		(0.04)			
Months of education since Oct. 17	1,304	21.14	3.07	***	3.16	***	0.00	0.00
		(8.46)	(0.70)		(0.69)			
Panel B: Marriage & fertility								
Married	1,344	0.14	-0.07	***	-0.07	***	0.00	0.04
		(0.35)	(0.02)		(0.02)			
Married before 16 (if 16 or above)	921	0.04	-0.02		-0.02		0.08	0.20
		(0.19)	(0.01)		(0.01)			
Married before 17 (if 17 or above)	499	0.11	-0.07	***	-0.07	***	0.01	0.11
		(0.31)	(0.02)		(0.02)			
Married before 18 (if 18 or above)	151	0.21	-0.15	***	-0.17	***	0.01	0.11
		(0.41)	(0.05)		(0.06)			
Promised (if not married)	1,344	0.10	-0.03	*	-0.03	*	0.06	0.20
		(0.30)	(0.02)		(0.02)			
Ever been pregnant	1,344	0.03	-0.01		-0.01		0.31	0.34
		(0.18)	(0.01)		(0.01)			
Panel C: Well-being								
Life satisfaction (standardized 10-point Likert scale)	1,344	0.00	0.25	**	0.25	**	0.05	0.18
		(1.00)	(0.12)		(0.12)			
Happiness (standardized 4-point Likert scale)	1,344	0.00	0.06		0.06		0.34	0.37
		(1.00)	(0.07)		(0.07)			
Strata fixed effects			YES		YES		YES	YES
Covariates			NO		DL		ALL	ALL

Notes: In this table, we describe the average treatment effect of the intervention on our primary outcomes (education, marriage and fertility, and well-being). In column (1), we report the mean (and standard deviation) in the control group for each outcome. In column (2), we report the estimate we obtain when estimating equation (1). In column (3), we re-estimate equation (1) adding covariates selected using a double lasso procedure. In column (4), we report the p-value associated with the coefficients displayed in column (2). In column (5), we report the associated Romano Wolf adjusted p-values to control for Family-Wise Error Rates (1,000 bootstrap replications). A family of outcomes consists of all the outcomes displayed under the same panel. In the last row of the table, "NO" indicates that no additional covariates were added to the estimated equation, "DL" indicates that the covariates were selected by a Double Lasso procedure, and "ALL" indicates that all the covariates included in Tables 1 and 2 were added to the estimated equation.

Table 4: IV estimates of the impact of secondary education on marriage and welfare

		C_{100}	T_{100}-C_{100}			P-values	
		(1)	(2)		(3)	(4)	(5)
	# Obs	Mean (s.d.)	Diff. (s.e.)	Sig.	Diff. (s.e.) Sig.	Uncorr. p-values	RW p-values
Panel A: Marriage & fertility							
Married	1,344	0.14	-0.19	***	-0.19 ***	0.00	0.03
		(0.35)	(0.06)		(0.06)		
Married before 16 (if 16 or above)	921	0.04	-0.05	*	-0.05 *	0.06	0.20
		(0.19)	(0.03)		(0.03)		
Married before 17 (if 17 or above)	499	0.11	-0.19	***	-0.19 ***	0.00	0.05
		(0.31)	(0.06)		(0.07)		
Married before 18 (if 18 or above)	151	0.21	-0.30	**	-0.30 **	0.00	0.05
		(0.41)	(0.12)		(0.13)		
Promised (if not married)	1,344	0.10	-0.09		-0.09 *	0.12	0.29
		(0.30)	(0.05)		(0.05)		
Ever been pregnant	1,344	0.03	-0.02		-0.02	0.17	0.29
		(0.18)	(0.03)		(0.03)		
Panel B: Well-being							
Life satisfaction (standardized 10-point Likert scale)	1,344	0.00	0.75	*	0.74 **	0.05	0.17
		(1.00)	(0.39)		(0.38)		
Happiness (standardized 4-point Likert scale)	1,344	0.00	0.16		0.17	0.35	0.39
		(1.00)	(0.22)		(0.21)		
Strata fixed effects			YES		YES	YES	YES
Covariates			NO		DL	ALL	ALL

Notes: In this table, we document the effect of one additional year of education on marriage, fertility, and well-being. To do so, we instrument the number of additional years of education since september 2017 by a dummy variable indicating that the respondent lives in a pure treatment group village (*versus* a pure control village). In column (1), we report the mean (and standard deviation) in the control group for each outcome. In column (2), we report the estimate we obtain when strata fixed effects are added to the regression. In column (3), we add covariates selected using a double lasso procedure. In column (4), we report the p-value associated with the coefficients displayed in column (2). In column (5), we report the associated Romano Wolf adjusted p-values to control for Family-Wise Error Rates (1,000 bootstrap replications). A family of outcomes consists of all the outcomes displayed under the same panel.

In the last row of the table, "NO" indicates that no additional covariates were added to the estimated equation, "DL" indicates that the covariates were selected by a Double Lasso procedure, and "ALL" indicates that all the covariates included in Tables 1 and 2 were added to the estimated equation.

Table 5: Impact on girls' aspirations

		C_{100}	T_{100}-C_{100}				P-values	
		(1)	(2)		(3)		(4)	(5)
	# Obs	Mean (s.d.)	Diff. (s.e.)	Sig.	Diff. (s.e.)	Sig.	Uncorr. p-values	RW p-values
Panel A: Educational aspirations								
Wishes to attend high school	1,344	0.64	0.06	*	0.07	*	0.05	0.07
		(0.48)	(0.04)		(0.04)			
Wishes to complete high school	1,344	0.60	0.08	*	0.08	**	0.01	0.03
		(0.49)	(0.04)		(0.04)			
Wishes to pursue higher education	1,344	0.30	0.16	***	0.16	***	0.00	0.00
		(0.46)	(0.05)		(0.04)			
Panel B: Professional aspirations								
Wishes to work outside the home in non-family activities before getting married	1,199	0.83	0.04		0.04		0.31	0.52
		(0.38)	(0.03)		(0.03)			
Wishes to work outside the home in non-family activities once married with young children	1,199	0.80	0.03		0.03		0.70	0.73
		(0.40)	(0.04)		(0.04)			
Wishes to work outside the home in non-family activities once children are grown up	1,191	0.74	0.07		0.07		0.13	0.35
		(0.44)	(0.04)		(0.04)			
Wishes to have a traditional occupation	1,344	0.20	-0.06	*	-0.06	*	0.04	0.28
		(0.40)	(0.03)		(0.03)			
Wishes to have a modern occupation	1,344	0.78	0.07	*	0.06	*	0.06	0.28
		(0.41)	(0.04)		(0.04)			
Expected monthly income (in 1,000 XOF)	1,090	139.88	20.46	*	21.22	*	0.02	0.22
		(127.58)	(10.95)		(10.90)			
Panel C: Family aspirations								
Wishes to get married (if not already married)	1,199	0.95	0.00		0.00		0.81	0.84
		(0.21)	(0.01)		(0.01)			
Age at which the girl wants to get married (if she wants to)	1,137	19.98	0.70	***	0.66	***	0.00	0.01
		(2.60)	(0.20)		(0.20)			
Wants children (if she does not have any)	1,271	0.97	-0.01		-0.01		0.22	0.43
		(0.18)	(0.01)		(0.01)			
Age at which the girl wants her first child (if she wants some)	1,189	21.34	0.93	***	0.91	***	0.00	0.01
		(2.81)	(0.22)		(0.21)			
Strata fixed effects			YES		YES		YES	YES
Covariates			NO		DL		ALL	ALL

Notes: In this table, we describe the average treatment effect of the intervention on respondents' aspirations related to education, work, marriage and fertility. In column (1), we report the mean (and standard deviation) in the control group for each outcome. In column (2), we report the estimate we obtain when estimating equation (1). In column (3), we re-estimate equation (1) adding covariates selected using a double lasso procedure. In column (4), we report the p-value associated with the coefficients displayed in column (2). In column (5), we report the associated Romano Wolf adjusted p-values to control for Family-Wise Error Rates (1,000 bootstrap replications). A family of outcomes consists of all the outcomes displayed under the same panel.

In the last row of the table, "NO" indicates that no additional covariates were added to the estimated equation, "DL" indicates that the covariates were selected by a Double Lasso procedure, and "ALL" indicates that all the covariates included in Tables 1 and 2 were added to the estimated equation.

Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 6: Impact on mothers' aspirations

		C_{100}	T_{100}-C_{100}				P-values	
		(1)	(2)		(3)		(4)	(5)
	# Obs	Mean (s.d.)	Diff. (s.e.)	Sig.	Diff. (s.e.)	Sig.	Uncorr. p-values	RW p-values
Panel A: Education-related aspirations								
Mothers want their daughter to reach...								
High school	1,354	0.46	0.05		0.05		0.41	0.45
		(0.50)	(0.05)		(0.05)			
Higher education	1,354	0.28	0.10	**	0.10	**	0.06	0.12
		(0.45)	(0.05)		(0.05)			
Panel B: Work-related aspirations								
Mothers want their daughter to have a...								
Traditional occupation	1,314	0.27	-0.13	***	-0.13	***	0.00	0.00
		(0.44)	(0.03)		(0.03)			
Modern occupation	1,314	0.73	0.13	***	0.13	***	0.00	0.00
		(0.44)	(0.03)		(0.03)			
Panel C: Family-related aspirations								
Desired age at time of marriage	1,319	20.23	0.59	**	0.60	**	0.01	0.02
		(3.19)	(0.29)		(0.28)			
Strata fixed effects			YES		YES		YES	YES
Covariates			NO		DL		ALL	ALL

Notes: In this table, we describe the average treatment effect of the intervention on the aspirations recipients' mothers have for them. In column (1), we report the mean (and standard deviation) in the control group for each outcome. In column (2), we report the estimate we obtain when estimating equation (1). In column (3), we re-estimate equation (1) adding covariates selected using a double lasso procedure. In column (4), we report the p-value associated with the coefficients displayed in column (2). In column (5), we report the associated Romano Wolf adjusted p-values to control for Family-Wise Error Rates (1,000 bootstrap replications). A family of outcomes consists of all the outcomes displayed under the same panel.

In the last row of the table, "NO" indicates that no additional covariates were added to the estimated equation, "DL" indicates that the covariates were selected by a Double Lasso procedure, and "ALL" indicates that all the covariates included in Tables 1 and 2 were added to the estimated equation.

Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 7: Impact on human capital

		C_{100}	T_{100}-C_{100}			P-values	
		(1)	(2)		(3)	(4)	(5)
		Mean	Diff.		Diff.	Uncorr.	RW
	# Obs	(s.d.)	(s.e.)	Sig.	(s.e.) Sig.	p-values	p-values
Panel A: Academic skills							
Academic score	1,344	0.00	0.15		0.16 *	0.05	0.11
		(1.00)	(0.10)		(0.09)		
Numeracy score	1,344	0.00	0.18	**	0.18 **	0.02	0.06
		(1.00)	(0.09)		(0.09)		
Literacy score	1,344	0.00	0.09		0.10	0.18	0.24
		(1.00)	(0.09)		(0.09)		
Panel B: Psychosocial skills							
Psychosocial skills score	1,344	0.00	0.07		0.07	0.24	0.67
		(1.00)	(0.10)		(0.10)		
Problem solving (13 items)	1,344	0.00	0.06		0.06	0.22	0.67
		(1.00)	(0.09)		(0.09)		
Perseverance (6 items)	1,344	0.00	0.05		0.05	0.34	0.67
		(1.00)	(0.10)		(0.10)		
Self-awareness (11 items)	1,344	0.00	0.09		0.09	0.24	0.67
		(1.00)	(0.10)		(0.10)		
Interpersonal skills (7 items)	1,344	0.00	-0.03		-0.03	0.91	0.92
		(1.00)	(0.12)		(0.12)		
Self-efficacy (9 items)	1,344	0.00	0.11		0.11	0.17	0.63
		(1.00)	(0.08)		(0.08)		
Creativity (4 items)	1,344	0.00	0.08		0.08	0.14	0.61
		(1.00)	(0.09)		(0.09)		
Panel C: SRH-related knowledge (age>14)							
SRH-Knowledge score	1,272	0.00	0.04		0.04	0.54	0.86
		(1.00)	(0.12)		(0.12)		
Knowledge about pregnancy and delivery (6 items)	1,272	0.00	0.03		0.03	0.66	0.91
		(1.00)	(0.11)		(0.11)		
Knowledge about contraceptive methods (13 items)	1,272	0.00	-0.02		-0.02	0.90	0.91
		(1.00)	(0.11)		(0.11)		
Knowledge about HIV (8 items)	1,272	0.00	0.09		0.09	0.31	0.73
		(1.00)	(0.11)		(0.11)		
Strata fixed effects			YES		YES	YES	YES
Covariates			NO		DL	ALL	ALL

Notes: In this table, we describe the average treatment effect of the intervention on respondents' skills (academic skills, psychosocial skills) and sexual and reproductive health knowledge. In column (1), we report the mean (and standard deviation) in the control group for each outcome. In column (2), we report the estimate we obtain when estimating equation (1). In column (3), we re-estimate equation (1) adding covariates selected using a double lasso procedure. In column (4), we report the p-value associated with the coefficients displayed in column (2). In column (5), we report the associated Romano Wolf adjusted p-values to control for Family-Wise Error Rates (1,000 bootstrap replications). A family of outcomes consists of all the outcomes displayed under the same panel.

In the last row of the table, "NO" indicates that no additional covariates were added to the estimated equation, "DL" indicates that the covariates were selected by a Double Lasso procedure, and "ALL" indicates that all the covariates included in Tables 1 and 2 were added to the estimated equation.

Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 8: Impact on preferences

		C_{100}	T_{100}-C_{100}			P-values	
		(1)	(2)		(3)	(4)	(5)
		Mean	Diff.		Diff.	Uncorr.	RW
	# Obs	(s.d.)	(s.e.)	Sig.	(s.e.) Sig.	p-values	p-values
Panel A: Opinions on marriage and fertility							
Ideal age for a woman to get married	1,333	18.05	0.49	***	0.49 ***	0.00	0.03
		(2.14)	(0.17)		(0.17)		
Ideal age for a man to get married	1,329	23.22	0.77	**	0.77 **	0.01	0.05
		(3.73)	(0.30)		(0.30)		
There are disadvantages to getting married before 18	1,344	0.42	0.06		0.06	0.15	0.28
		(0.49)	(0.04)		(0.04)		
There are disadvantages to having a child before 18	1,344	0.47	0.04		0.04	0.28	0.33
		(0.50)	(0.04)		(0.04)		
Panel B: Opinions on gender equality							
Gender equality opinions index	1,344	0.00	-0.04		-0.04	0.63	0.97
		(1.00)	(0.07)		(0.07)		
Men should have the highest level of education in the family	1,344	0.44	-0.04		-0.04	0.21	0.83
		(0.50)	(0.04)		(0.04)		
Men should earn money for the family	1,344	0.80	-0.09	**	-0.09 **	0.01	0.12
		(0.40)	(0.04)		(0.04)		
Women should be responsible for washing, cleaning and cooking	1,344	0.95	-0.01		-0.01	0.85	0.97
		(0.21)	(0.01)		(0.01)		
Women should be responsible for fetching water	1,344	0.55	0.04		0.04	0.13	0.74
		(0.50)	(0.03)		(0.03)		
Women should be responsible for feeding and bathing children	1,344	0.85	-0.02		-0.02	0.64	0.97
		(0.35)	(0.03)		(0.03)		
Women should be responsible for caring for the sick	1,344	0.35	0.03		0.03	0.46	0.97
		(0.48)	(0.04)		(0.04)		
Women should be responsible for helping children with their studies at home	1,344	0.21	0.01		0.01	0.66	0.97
		(0.41)	(0.03)		(0.03)		
Sons' ideal education length (in years)	1,344	11.97	0.69	*	0.69 *	0.03	0.31
		(3.75)	(0.37)		(0.36)		
Daughters' ideal education length (in years)	1,344	11.11	0.84	**	0.84 **	0.01	0.12
		(3.38)	(0.34)		(0.34)		
Would be ideal for sons to work	1,344	0.88	0.03		0.03	0.30	0.90
		(0.32)	(0.03)		(0.03)		
Would be ideal for daughters to work	1,344	0.86	0.02		0.02	0.48	0.97
		(0.35)	(0.03)		(0.03)		
Panel C: Opinions on domestic violence							
Tolerance vis-à-vis domestic violence index	1,344	0.00	-0.13		-0.13	0.13	0.46
		(1.00)	(0.10)		(0.10)		
Beating wife is justified if she burns the food	1,344	0.15	-0.03		-0.03	0.19	0.58
		(0.36)	(0.03)		(0.03)		
Beating wife is justified if she argues with her husband	1,344	0.31	-0.04		-0.04	0.33	0.66
		(0.46)	(0.04)		(0.04)		
Beating wife is justified if she goes out without telling her husband	1,344	0.36	-0.03		-0.03	0.42	0.67
		(0.48)	(0.05)		(0.05)		
Beating wife is justified if she neglects the children	1,344	0.35	-0.05		-0.05	0.24	0.60
		(0.48)	(0.04)		(0.04)		
Beating wife is justified if she refuses to have sex with her husband	1,344	0.36	-0.08	*	-0.08 *	0.04	0.22
		(0.48)	(0.04)		(0.04)		
Beating wife is justified if she talks to her husband about protecting from AIDS	1,344	0.20	-0.03		-0.03	0.44	0.67
		(0.40)	(0.03)		(0.03)		
Strata fixed effects			YES		YES	YES	YES
Covariates			NO		DL	ALL	ALL

Notes: In this table, we describe the average treatment effect of the intervention on respondents' preferences. In column (1), we report the mean (and standard deviation) in the control group for each outcome. In column (2), we report the estimate we obtain when estimating equation (1). In column (3), we re-estimate equation (1) adding covariates selected using a double lasso procedure. In column (4), we report the p-value associated with the coefficients displayed in column (2). In column (5), we report the associated Romano Wolf adjusted p-values to control for Family-Wise Error Rates (1,000 bootstrap replications). A family of outcomes consists of all the outcomes displayed under the same panel.
In the last row of the table, "NO" indicates that no additional covariates were added to the estimated equation, "DL" indicates that the covariates were selected by a Double Lasso procedure, and "ALL" indicates that all the covariates included in Tables 1 and 2 were added to the estimated equation.
Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 9: Externalities on eligible non-treatment girls

	C50-C100				P-values		T50-T100				P-values	
		(1)	(2)		(3)	(4)		(5)	(6)		(7)	(8)
		C_{100}	Diff.					T_{100}	Diff.			
		Mean	C_{50}-C_{100}		Uncorr.	RW		Mean	T_{50}-T_{100}		Uncorr.	RW
	# Obs	(s.d.)	(s.e.)		p-values	p-values	# Obs	(s.d.)	(s.e.)		p-values	p-values
Panel A: Education												
Dropped out	1,003	0.40	-0.01		0.75	0.98	1,027	0.19	0.06		0.09	0.37
		(0.49)	(0.04)					(0.40)	(0.05)			
Enrolled in:												
Grade 6	972	0.06	0.00		0.72	0.98	1,007	0.04	-0.02		0.27	0.49
		(0.24)	(0.02)					(0.20)	(0.02)			
Grade 7	972	0.21	0.02		0.58	0.96	1,007	0.41	-0.06		0.15	0.44
		(0.41)	(0.03)					(0.49)	(0.04)			
Grade 8 & above	972	0.31	0.00		0.87	0.99	1,007	0.35	0.00		0.96	0.95
		(0.46)	(0.04)					(0.48)	(0.04)			
Months of education since Oct. 17	961	21.14	0.05		0.92	0.99	1,010	24.22	-0.87		0.12	0.42
		(8.46)	(0.80)					(6.55)	(0.74)			
Panel B: Marriage & fertility												
Married	1,003	0.14	-0.03		0.32	0.88	1,027	0.08	0.03		0.11	0.33
		(0.35)	(0.03)					(0.26)	(0.03)			
Married before 16 (if 16 or above)	696	0.04	0.00		0.84	0.97	718	0.02	0.01		0.16	0.33
		(0.19)	(0.02)					(0.13)	(0.01)			
Married before 17 (if 17 or above)	392	0.11	-0.02		0.32	0.88	373	0.03	0.06	**	0.02	0.16
		(0.31)	(0.03)					(0.18)	(0.03)			
Married before 18 (if 18 or above)	116	0.21	-0.03		0.97	0.97	126	0.06	0.14	**	0.00	0.07
		(0.41)	(0.09)					(0.24)	(0.07)			
Promised (if not married)	1,003	0.10	-0.01		0.52	0.89	1,027	0.06	0.01		0.44	0.45
		(0.30)	(0.02)					(0.25)	(0.02)			
Ever been pregnant	1,003	0.03	0.01		0.40	0.89	1,027	0.03	0.02	*	0.05	0.22
		(0.18)	(0.01)					(0.16)	(0.01)			
Panel C: Well-being												
Life satisfaction (standardized 10-point Likert scale)	1,003	0.00	0.22	**	0.02	0.10	1,027	0.27	-0.01		0.81	0.82
		(1.00)	(0.11)					(0.90)	(0.08)			
Happiness (standardized 4-point Likert scale)	1,003	0.00	0.03		0.86	0.88	1,027	0.06	-0.10		0.28	0.51
		(1.00)	(0.09)					(1.25)	(0.07)			
Strata fixed effects			YES		YES	YES			YES		YES	YES
Covariates			DL		ALL	ALL			DL		ALL	ALL

Notes: In this table, we document spillover effects in relation to education, marriage, and fertility. To do so we estimated equations (3a) and (3b). Strata fixed effects were added to the estimated equation as well as covariates selected by a double lasso procedure.
In the last row of the table, "DL" indicates that the covariates were selected by a Double Lasso procedure, and "ALL" indicates that all the covariates included in Tables 1 and 2 were added to the estimated equation.
Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Table 10: Externalities on non-eligible girls

		C_{100}	T_{100}-C_{100}			
		(1)	(2)		(3)	
	# Obs	Mean (s.d.)	Diff. (s.e.)	Sig.	Diff. (s.e.)	Sig.
Panel A: Ineligible aged 12-24 girls within the household						
a. Marriage						
Number of other girls married	1,363	0.21	0.00		0.00	
		(0.52)	(0.03)		(0.03)	
Number of other girls under 18 married	1,363	0.03	0.02		0.02	
		(0.18)	(0.01)		(0.01)	
b. Education						
Years of education for other girls	1,363	2.79	-0.17		-0.11	
		(1.93)	(0.14)		(0.12)	
Years of education for other girls under 18	1,247	2.99	-0.05		-0.06	
		(1.94)	(0.13)		(0.13)	
Panel B: Ineligible girls in the community						
Number of marriages in the community	1,043	7.01	0.00		0.00	
		(6.51)	(0.68)		(0.67)	
Number of marriages in the community, girls under 18	1,042	2.85	0.06		0.06	
		(3.58)	(0.41)		(0.41)	
Strata fixed effects			YES		YES	
Double lasso procedure to select baseline covariates			NO		YES	

Notes: In this table, we document the spillover effects on non-eligible girls, both in and out of eligible girls' households. In column (1), we report the mean (and standard deviation) in the control group for each outcome. In column (2), we report the estimate we obtain when estimating equation (1). In column (3), we re-estimate equation (1) adding covariates selected using a double lasso procedure. Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Appendix Table A1: Lee bounds for impact on life outcomes

	Main results				Lee bounds				
		C_{100}	T_{100}-C_{100}						
		(1)	(2)			(3)		(4)	
	# Obs	Mean (s.d.)	Diff. (s.e.)	Sig.	# Obs	Lower bounds	Sig.	Upper bounds	Sig.
Panel A: Education									
Dropped out	1,344	0.40	-0.21	***	1,305	-0.25	***	-0.21	***
		(0.49)	(0.04)			(0.04)		(0.04)	
Enrolled in:									
Grade 6	1,315	0.06	-0.02		1,276	-0.04	**	-0.02	
		(0.24)	(0.02)			(0.02)		(0.02)	
Grade 7	1,315	0.21	0.20	***	1,276	0.17	***	0.22	***
		(0.41)	(0.04)			(0.04)		(0.04)	
Grade 8 & above	1,315	0.31	0.05		1,276	0.02		0.06	
		(0.46)	(0.04)			(0.04)		(0.04)	
Months of education since Oct. 17	1,304	21.14	3.16	***	1,265	3.05	***	4.02	***
		(8.46)	(0.69)			(0.71)		(0.60)	
Panel B: Marriage & fertility									
Married	1,344	0.14	-0.07	***	1,305	-0.09	***	-0.06	***
		(0.35)	(0.02)			(0.02)		(0.02)	
Married before 16 (if 16 or above)	921	0.04	-0.02		882	-0.03	***	-0.02	
		(0.19)	(0.01)			(0.01)		(0.01)	
Married before 17 (if 17 or above)	499	0.11	-0.07	***	460	-0.08	***	-0.06	**
		(0.31)	(0.02)			(0.02)		(0.02)	
Married before 18 (if 18 or above)	151	0.21	-0.17	***	118	-0.14	**	-0.13	**
		(0.41)	(0.06)			(0.06)		(0.06)	
Promised (if not married)	1,344	0.10	-0.03	*	1,305	-0.06	***	-0.03	
		(0.30)	(0.02)			(0.02)		(0.02)	
Ever been pregnant	1,344	0.03	-0.01		1,305	-0.02	**	-0.01	
		(0.18)	(0.01)			(0.01)		(0.01)	
Panel C: Well-being									
Life satisfaction (standardized 10-point Likert scale)	1,344	0.00	0.25	**	1,305	0.19	*	0.33	***
		(1.00)	(0.12)			(0.12)		(0.11)	
Happiness (standardized 4-point Likert scale)	1,344	0.00	0.06		1,305	-0.01		0.07	
		(1.00)	(0.07)			(0.06)		(0.07)	
Strata fixed effects			YES			YES		YES	
Double lasso procedure to select baseline covariates			YES			YES		YES	

Notes: In this table, we bound the average treatment effect of the intervention on our primary outcomes (education, marriage and fertility, and well-being). In column (1), we report the mean (and standard deviation) in the control group for each outcome. In column (2), we report the estimate we obtain when estimating equation (1) with covariates selected using a double lasso procedure. In columns (3) and (4), we report Lee bounds to account for differential attrition. For both bounds, we report the estimate we obtain by estimating equation (1) with covariates selected using a double lasso procedure. Because we randomized within strata, trimming is performed within strata.

Standard errors are clustered at the village level. *, **, *** denote significance at the 10, 5 and 1 percent levels respectively.

Appendix Table A2: Detailed impacts on academic skills

		C_{100}	T_{100} - C_{100}		P-values	
	Total nber of obs.	(1) Mean (s.d.)	(2) Diff. (s.e.)	(3) Diff. (s.e.)	(4) Uncorr. p-values	(5) RW p-values
Panel A: Literacy						
Literacy score (0 to 4)	1,344	1.80	0.09	0.10	0.18	0.35
		(1.60)	(0.09)	(0.09)		
Can read letters	1,344	0.75	0.14 *	0.15 *	0.04	0.14
		(0.43)	(0.08)	(0.08)		
Can read words	1,344	0.41	0.03	0.04	0.48	0.54
		(0.49)	(0.09)	(0.08)		
Can read paragraphs	1,344	0.35	0.07	0.08	0.28	0.45
		(0.48)	(0.09)	(0.08)		
Can understand short stories	1,344	0.30	0.06	0.07	0.27	0.45
		(0.46)	(0.09)	(0.08)		
Panel B: Mathematics						
Numeracy score (0 to 4)	1,344	2.91	0.18 **	0.18 **	0.02	0.10
		(1.25)	(0.09)	(0.09)		
Can count	1,344	0.93	0.07	0.07	0.30	0.34
		(0.25)	(0.07)	(0.07)		
Can identify numbers	1,344	0.93	0.07	0.07	0.30	0.34
		(0.25)	(0.07)	(0.07)		
Can compare numbers	1,344	0.90	0.10	0.10	0.15	0.24
		(0.30)	(0.07)	(0.07)		
Can do additions	1,344	0.72	0.20 **	0.20 **	0.00	0.02
		(0.45)	(0.08)	(0.08)		
Can do substractions	1,344	0.60	0.15 *	0.15 *	0.03	0.12
		(0.49)	(0.08)	(0.08)		
Can do multiplications	1,344	0.54	0.17 **	0.17 **	0.03	0.12
		(0.50)	(0.09)	(0.09)		
Can do divisions	1,344	0.47	0.15 *	0.15 *	0.06	0.18
		(0.50)	(0.09)	(0.08)		
Strata fixed effects			YES	YES	YES	YES
Covariates			NO	DL	ALL	ALL

Notes: In this table, we describe the average treatment effect of the intervention on respondents' academic skills. In column (1), we report the mean (and standard deviation) in the control group for each outcome. In columns (2) and (3), we report on the impact of the intervention. In column (2), we report the estimate we obtain when estimating equation (1). In column (3), we re-estimate equation (1) adding covariates selected using a double lasso procedure. In column (4), we report the p-value associated with the coefficients displayed in column (2). In column (5), we report the associated Romano Wolf adjusted p-values to control for Family-Wise Error Rates (1,000 bootstrap replications). A family of outcomes consists of all the outcomes displayed under the same panel..

In the last row of the table, "NO" indicates that no additional covariates were added to the estimated equation, "DL" indicates that the covariates were selected by a Double Lasso procedure, and "ALL" indicates that all the covariates included in Tables 1 and 2 were added to the estimated equation.