Working Paper

On the Doorstep of Adulthood: Empowering Economic and Fertility Choices of Young Women[*]

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Abstract

We report from a large-scale randomized controlled trial of women empowerment in Tanzania investigating how two different empowerment strategies, economic empowerment and reproductive health empowerment, shape the economic and fertility

choices of young women when they transition into adulthood. The analysis builds on a rich data set (survey, experimental, and medical data) collected over more than five years. The economic empowerment reduces poverty, while teenage pregnancy increases with both economic and reproductive health empowerment. The increase in fertility comes from a positive income effect and by women entering earlier into a relationship. We also provide evidence of the importance of social norms and labor market flexibility in explaining the income and relationship effects on fertility. The findings provide new insights on the economics of fertility, and show the importance of a comprehensive approach to women empowerment.

1   Introduction.

Adolescence is a critical period in life. It is a time for decisions with potentially lifelong consequences for education and employment (Aizer et al., 2020; Bailey, 2006; Goldin and Katz, 2002; Miller, 2010). In many countries, young women are in a particularly vulnerable position, owing to limited educational and labor market opportunities and the risk of early pregnancy (Dhar et al., 2022; Duflo, 2012; Field and Ambrus, 2008). Empowering women by increasing their opportunities and strengthening their decision-making power is therefore a major concern for governments, nongovernmental organizations, and donors, as reflected in the Sustainable Development Goals of the United Nations.

The decisions of young women are also of great importance for understanding societal changes and economic development. Their fertility choices shape the demographic dynamics in a society, while their economic choices have wide-ranging effects on the labor market (Bandiera et al., 2022). However, we still have limited understanding of how the fertility and economic choices of young women interact. Do young women lack control over their fertility, leading to early childbearing and limited economic achievements (Goldin and Katz, 2002; Herrera et al., 2019; Lundborg et al., 2017; Miller, 2010; Rasul, 2008), or do limited economic opportunities encourage them to establish a family and start childbearing at an early age (Heath and Mobarak, 2015; Jensen, 2012)?

We investigate these questions in a large-scale cluster-randomized trial of two empowerment programs involving almost 3,500 young women in Tanzania, who at the time of the

intervention were in their final year of secondary school. The aim of the programs was to empower these women in the transition from childhood to adulthood by expanding their opportunities and strengthening their decision-making power. The economic empowerment program provided them with entrepreneurship training on how they could establish and run their own business, while the reproductive health program aimed at enabling them to take control of and protect their own body, health, and fertility.

To explore how the fertility and economic choices of the women interact, we implement a factorial experimental design with a control group and three treatment arms: some women were offered the economic empowerment program, some were offered the reproductive health empowerment program, and some were offered both programs. We establish a rich data set consisting of survey data, experimental lab-in-the-field data, and medical data, collected in three follow-up rounds: short term (a few weeks after the intervention), medium term (one year after the intervention), and long term (three to four years after the intervention). The research design allows us to provide novel evidence on how young women in vulnerable situations make critical economic and fertility choices as they transition into adulthood.

We find that providing young women with economic opportunities has a large positive effect on their income. The women offered the economic empowerment program are consistently across all three follow-up rounds more likely to be self-employed and to have higher incomes than the other women. We estimate that the economic empowerment program alone causes an average increase in long-term income of 80–100 percent, and a decrease of four to six percentage points in the share of women with an income below the poverty line. However, contrary to what we hypothesized, greater economic opportunities do not cause a decrease in fertility. Indeed we find an almost doubling of teenage pregnancy (giving birth before 20 years old), and a 15 percent increase in childbearing compared with the control group.

The reproductive health empowerment program does not have any effect in the economic domain, but caused an increase in fertility. For those women receiving only the reproductive health empowerment program, we estimate a 50 percent increase in teenage pregnancy and a 15 percent increase in the proportion of women who have started childbearing. These patterns are identical for women offered both empowerment programs:

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they experience an increase in income and fertility compared with the control group. We do not find any complementarity between the two empowerment programs in the economic domain, but do observe a significant negative complementarity in the reproductive health domain. The estimated treatment effects are robust across subgroups defined by individual (cognitive ability, age), family (wealth), and school (remoteness) characteristics.

The mechanism analysis provides a consistent picture across the follow-up rounds of how the economic empowerment program led to an increase in the women's income: it provided them with economic knowledge and an entrepreneurial mind-set, which over time caused an increase in self-employment and income. We further show that there is a positive income effect on fertility, and provide evidence suggesting that social norms and labor market flexibility are two important mechanisms explaining this effect.

The reproductive health empowerment program increased the decision-making power of the women, but also led to important behavioral changes. In particular, we find that a larger proportion of the women who received the reproductive health empowerment program established a relationship at an early age, and the evidence suggests that this caused an increase in fertility. The relationship effect on fertility may be driven by the cost of having children being lower in a relationship, but we also provide evidence suggesting that this effect partly reflects social norms where women perceive an increase in social pressure to have a child when they enter a relationship.

The paper contributes to the growing literature on women empowerment (Ashraf et al., 2020; Bandiera et al., 2020; Berge et al., 2015; Buchmann et al., 2018; Buehren et al., 2017; Dhar et al., 2022; Duflo, 2012; Dupas, 2011; Field et al., 2010; Karlan and Valdivia, 2011), which has only to a limited extent studied the effect of women empowerment on fertility. In the Online Appendix, Figure B1, we provide an overview of the estimated effects of women empowerment on fertility in the existing literature. We establish 37 point estimates of how women empowerment affects fertility, 23 are negative and 14 are positive, but cannot reject the null hypothesis of no effect in 28 cases (and many confidence intervals are very large). The effect is often measured in the short-term, leaving little time for control and treatment groups to differ in terms of fertility. There are only two randomized controlled trials that estimate effects both on fertility and income (Bandiera

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et al., 2020; Jensen, 2012), and thus most of the existing literature cannot speak to how income changes affect fertility. We enrich this literature by reporting from, to the best of our knowledge, the first randomized controlled trial that contains two separate empowerment programs in the economic domain and in the reproductive health domain and a combined program, with long-term data on the effects on both income and fertility. This research design allows us to shed light on how economic and fertility choices interact in shaping the lives of young, vulnerable women. We also provide strong evidence of the economic empowerment program having a lasting income effect for these women, in contrast to many of the existing studies on entrepreneurship that largely find modest and transitory economic effects (Blattman and Ralston, 2015; Card et al., 2018; McKenzie, 2017; McKenzie and Woodruff, 2014). A plausible explanation for the strong long-term income effect in the present study is that we target women not yet constrained by family obligations (Berge et al., 2015; Bjorvatn et al., 2022; Karlan and Valdivia, 2011), in line with recent evidence from vocational training programs for youth in Uganda (Alfonsi et al., 2020).

We do not find evidence of the reproductive health empowerment program spilling over to the economic domain, but, in contrast to Duflo et al. (2015) and Buchmann et al. (2018), we find strong evidence of the reproductive health empowerment program affecting fertility choices. The differences between our results and the previous literature may reflect differences in the design of the empowerment programs; Duflo et al. (2015) studies the effect of a government's HIV prevention curriculum, which stresses abstinence until marriage, whereas Buchmann et al. (2018) studies a multifaceted empowerment program including education support and life skills training more broadly. The reproductive health empowerment program in the present study focused more specifically on life skills that could protect and empower women in the reproductive health domain. We find evidence of this training providing decision-making power and shaping the behavior of the women. In particular, we observe that they enter into a relationship earlier and, as a result, start childbearing at a younger age.

The findings in this paper also speak to the literature on how to understand and model fertility choices. The positive income effect on fertility goes against the classical view in economics that there is a negative relationship between income and fertility. The work of Becker (Becker, 1960; Becker and Barro, 1988) on the quality-quantity trade-off

of children provides a key mechanism for this negative relationship, together with the idea that an increase in the labor market opportunities of women reduces fertility by increasing the opportunity cost of women's time (Hotz et al., 1997; Schultz, 1997, 1985). Our findings are more in line with the new era in the economics of fertility (Doepke et al., 2022), showing that stylized facts both at the macro and micro level suggest a positive relationship between income and fertility. A growing literature has emphasized how social norms (Beach and Hanlon, 2022; Diebolt and Perrin, 2013; Fernandez and Fogli, 2009; Jensen and Oster, 2009; La Ferrara et al., 2012; Manski and Mayshar, 2003; Munshi and Myaux, 2006; Spolaore and Wacziarg, 2022) and labor market flexibility (Bandiera et al., 2022; Doepke et al., 2022; Zipfel, 2022) may contribute to explain why an increase in income may lead to an increase in fertility, and we provide evidence suggesting that both social norms and labor market flexibility are important in explaining the positive income effect in the present study. Finally, the positive relationship effect is remarkably consistent with the model of sexual behavior outlined in Duflo et al. (2015), which builds on the idea that the cost of pregnancy is lower when women are in a relationships. We also show that social norms may complement this mechanism, with women perceiving an increase in the social pressure to have a child when they are in a relationship.

The remainder of the paper is organized as follows. Section 2 introduces the background to the study and the research strategy, Section 3 details the research design, and Section 4 reports the results and discusses the mechanisms. Section 5 concludes. Supplementary analysis and material are provided in the Online Appendix.

2   Background and research strategy.

The study focuses on the situation that many young women in low-income countries face when transitioning into adulthood, characterized by limited *opportunities* and restricted *decision-making power*. These women are unlikely to continue their education, have few opportunities in the labor market, and face strong social pressure. As a result, they often end up doing domestic chores and starting a family earlier than planned (Bandiera et al., 2022; Dhar et al., 2022; Duflo, 2012; Fares et al., 2006; Field and Ambrus, 2008). In this context, we examine two empowerment strategies aiming at improving the opportunities

and decision-making power of young women; one focusing on empowering them in the economic domain through entrepreneurship training, and the other on empowering them in the reproductive health domain through life skills training.

The economic empowerment program aimed to provide the young women with the skills needed to start their own business and thereby increase their income potential, which we hypothesized would increase the opportunity cost of having children and through a substitution effect would delay their fertility (Becker, 1960; Mincer, 1963). The reproductive health empowerment program aimed to give women more control over their fertility decision, which we hypothesized would delay childbearing if early pregnancies partly reflect social pressure.

However, the empowerment programs could also lead to an increase in fertility. The economic empowerment program would increase fertility if the positive income effect outweighed the substitution effect, whereas the reproductive health empowerment program would increase fertility if the young women themselves preferred to have children when they gained more control over their fertility decision.

An important feature of our research strategy is that we also consider the impact of offering both empowerment programs, which allows us to address the question of whether there is a *complementarity* between economic and reproductive health empowerment. Economic choices and fertility choices are interdependent, and both types of empowerment may therefore be needed to make a difference in the lives of young women. To illustrate, young women only receiving economic empowerment may lack control over their fertility choices and consequently may not be able to delay fertility and increase their labor market participation when experiencing an increase in their income potential. At the same time, young women only receiving the reproductive health program may not delay fertility even if they gain control over it, because they lack better opportunities. Hence, we hypothesized that the combined empowerment approach would have stronger effects on both economic and fertility choices.

3 Research design.

This section describes the participants, the randomization, the interventions, the timeline of the study, and the empirical approach. The pre-analysis plans for the different rounds of the study are registered with the American Economic Association Randomized Controlled Trials Registry.[1] In Online Appendix C, we list and define all the variables used in this paper and identify whether they were listed in the pre-analysis plans.

3.1 Participants and randomization.

In Tanzania, to continue studying at an advanced level of secondary education, students must pass a national exam called the Certificate of Secondary Education Examination at the end of Form IV. Typically, many students from rural public schools fail this exam and then need to make important decisions about how to progress in life.[2] We timed the study so that the interventions were implemented close to when the women started making consequential livelihood and fertility decisions.

We selected four regions in central Tanzania (Tabora, Singida, Morogoro and Dodoma) and sampled 20 public schools in each region (excluding boys-only schools). The schools were part of the network of the implementing partner, Femina HIP, a leading nongovernmental organization with a mission of empowering youth.[3] In each school, all women in Form IV were invited to take part in the study, and everyone present when we conducted the baseline survey joined: 3,483 women in total. Following the baseline survey, we randomly allocated the 80 schools between a control group and three treatment arms: economic empowerment (Economic), sexual and reproductive empowerment (SRH), and both empowerment programs (Combined: Econ. & SRH). The randomization was blocked by school size (less than or more than 40 women in Form IV) and by region.

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[1]We registered one plan for each of the main survey rounds (Nos. 150, 511 and 2215). These are available on the registry's website: https://www.socialscienceregistry.org/. Due to space constraint, the complete set of pre-specified analyses could not be included in this paper but it is available upon request.

[2]At the national level, the press reported a pass rate of 27 percent when this study was implemented (Jumanne, 2017).

[3]Femina HIP organizes discussion clubs in more than two thousand schools across Tanzania. More information is available on its website: http://www.feminahip.or.tz/.

Table 1: Baseline summary statistics by treatment arm.

	Control Mean (s.d.)	SRH Mean (s.d.)	Economic Mean (s.d.)	Econ. & SRH Mean (s.d.)	*p-value* (F-stat)
Individual level					
Age > 17	.475	.505	.475	.516	0.761
	(.5)	(.5)	(.5)	(.5)	
Cognitive ability	.62	.56	.661	.652	0.079
	(.486)	(.497)	(.474)	(.476)	
Health knowledge	.563	.582	.557	.572	0.424
	(.215)	(.206)	(.214)	(.221)	
Business knowledge	.449	.457	.458	.481	0.618
	(.257)	(.258)	(.264)	(.277)	
Risk aversion	.482	.438	.455	.52	0.326
	(.5)	(.496)	(.498)	(.5)	
Household level					
Wealthy household	.539	.593	.578	.518	0.752
	(.499)	(.492)	(.494)	(.5)	
Household owns a business	.282	.244	.243	.226	0.777
	(.45)	(.43)	(.429)	(.418)	
Woman-headed household	.183	.198	.223	.191	0.301
	(.387)	(.399)	(.416)	(.394)	
School level					
Remote school	.428	.464	.472	.411	0.979
	(.495)	(.499)	(.499)	(.492)	
N women	55	59	66	58	0.393
	(14.97)	(15.98)	(22.14)	(11)	
Obs.	869	853	938	820	

Note: The table reports the means and the standard deviations of the background variables at baseline. We have background information for 3,480 out of 3,483 individuals in the sample. To test whether the background variables correlate with treatment assignment, each background variable is regressed on the treatment assignment dummies, with the p-value of the F-test of overall significance reported in the last column.

Table 1 provides an overview by treatment of the baseline variables pre-specified to be used as covariates in the estimation of the treatment effects. These variables capture important individual, household, and school characteristics. The individual characteristics are the women's age, proxies for cognitive ability, health and business knowledge, and a measure of risk aversion. The first row in Table 1 shows that about half of the women were aged 17 years or younger at the baseline. "Cognitive ability" is an indicator variable equal to one if the participant performed at least as well as the median on a short cognitive ability test, which amounts to about 60 percent of the participants. "Health knowledge" and "Business knowledge" are the proportions of correct answers on a set of health and business questions. We observe that the participants performed better on the health questions than on the business questions at baseline ($p < 0.01$). "Risk aversion" is an indicator variable equal to one if the participant made the safe choice in a hypothetical risky investment question, which about 47 percent of the participants did.

The household characteristics include the wealth of the household, whether the household head owns a business, and whether a woman heads the household. The variable "Wealthy household" is an indicator variable equal to one if the participant's household is above the median on a wealth index determined by whether the household owns a television, has access to electricity, and the number of days per week they eat meat for dinner. Most households did not have a television or access to electricity at baseline, and had meat only twice a week or less. "Household owns a business" and "Woman-headed household" are indicator variables equal to one if the household head owns a business and is a woman, respectively, which applied to only a minority of the households at baseline.

The school characteristics are the location of the school and school size. "Remote school" is an indicator variable equal to one if the school is located more than 30 minutes by car away from the district headquarters; this is the case for 36 of the 80 schools. "N women" captures school size in terms of the number of women in Form IV. On average, the schools had 56 women students in Form IV, with a range from 22 to 106.

The final column in Table 1 reports an F-test of whether the treatment indicators predict the baseline characteristics. The test is not significant for any of the variables, except for "Cognitive ability", which is slightly lower in the SRH treatment. Overall, Table 1 shows that the sample is fairly balanced across treatments. As pre-specified, we control for these baseline variables in all the main estimations.

The baseline survey also contains a range of other questions that shed light on the sample and context. The participants were asked what they would like to do if they could not continue secondary school after having completed Form IV. As shown in Panel A in Figure 1, only 14 percent listed starting a business as their preferred choice. The most common plans were to seek salaried employment or start vocational training, and fewer wanted to work as a domestic or in farming. The least desired option was starting a family and staying at home. In line with these ambitions, the average participant stated that they would like to marry at the age of 25 years and have three children, the first at the age of 26 years, see Panel B in Figure 1. Most of them, about 80 percent, believed that their parents would be unhappy if they became pregnant in the coming year, but they were less sure that a pregnancy would be perceived negatively by a boyfriend or society. On perceptions about sexual practices among Tanzanian women their age, 53 percent believed

| (a) Preferred future occupations | (b) Preferred age at first birth |
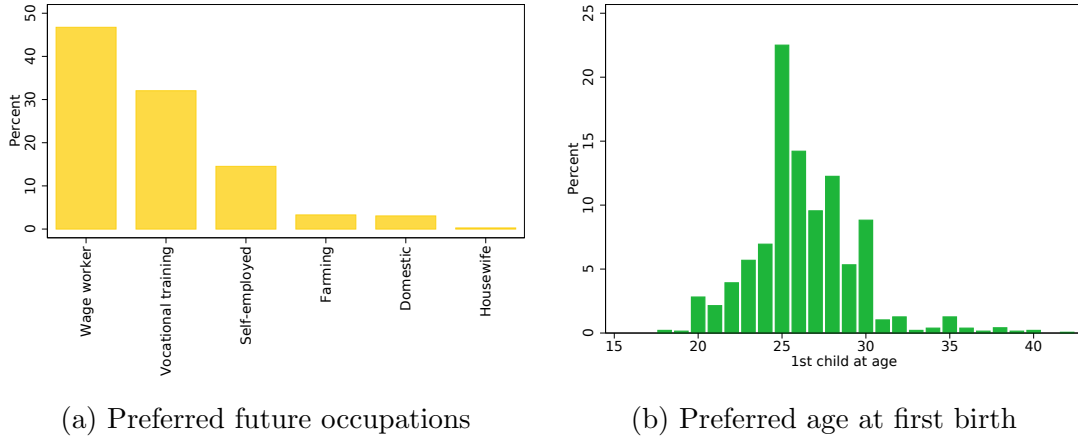
Figure 1: Preferred future occupation and age at first birth at baseline.

Note: The figure shows stated occupational and fertility preferences at baseline. Panel (a) shows the percentage of women who ranked the respective occupation as their most preferred occupation if they could not continue schooling; Panel (b) shows the distribution of the age at which the women prefer to have their first child.

that they had experienced sexual intercourse, 54 percent believed that they sometimes received money or gifts for having sex with older men, and around 40 percent believed that they were often sexually harassed.

3.2   Interventions.

The aim of the interventions was to empower the women in the transition from childhood to adulthood by increasing their *opportunities* and strengthening their *decision-making power*. The economic empowerment program (Economic) aimed to increase the opportunities and decision-making power in the economic domain by providing them with entrepreneurship training on how they could establish and run their own business and by providing perspectives on women's potential for making economic choices; the reproductive health empowerment program (SRH) aimed to increase the opportunities and decision-making power in the reproductive health domain by providing them with training that enabled them to take control of and protect their own body, health, and fertility.

The schools assigned to the Economic or SRH treatment arms offered eight weekly sessions of about two hours in the respective empowerment program, one session per week,

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while the schools assigned to the treatment arm with both the economic empowerment program and the reproductive health empowerment program (Combined) offered 16 bi-weekly sessions that covered both empowerment programs. The sessions were offered to all the Form IV female students at the treated schools and took place in a classroom setting during regular after-school hours. The control group carried on with their normal after-school activities of sports and games. The participants attended on average 83 percent of the sessions in the Economic treatment arm and 86 percent of the sessions in the SRH treatment arm. In the Combined treatment arm, they attended 89 percent of the reproductive health sessions and 88 percent of the economic sessions. In the short term follow-up, the treated women reported that the programs had been well organized, were very useful, and had provided them with new information.

The economic empowerment program started with a session discussing the challenges and opportunities that young women face in Tanzania, including that they are often expected to take care of younger children in the family and do the household chores. It then highlighted that both men and women have the same abilities, and that there were many opportunities for women, even though they had to overcome more challenges than men to succeed. The second session focused on how to be entrepreneurial in life and the attitudes and soft skills needed to be successful in business, including being self-confident, willing to take risks, and have a long-term orientation. This session also highlighted some of the benefits of being an entrepreneur in terms of earnings potential, independence, and contribution to society. The remaining sessions provided more specific training on how to identify a good business idea and run a business, and covered topics such as marketing, customer care, record keeping, product pricing, and business financing. Many of the discussions were illustrated with the experiences of role models, being young women who had succeeded in business. Taken together, the economic empowerment program aimed at both giving the young women new opportunities (by providing them with knowledge about how to start business) and greater decision-making power (by building self-confidence and awareness of women being as capable as men in the economic domain).

The reproductive health empowerment program started with a session focusing on how the body changes as women move from childhood to adulthood, and the accompanying feelings in this transition. It provided detailed knowledge on puberty and menstruation, and discussed how this affected their body image and made sexuality an important part of

their identity. The second session focused on how to establish a healthy relationship and the rights and responsibilities that come with having a partner. The following sessions focused on sexual practices, the risks of teenage pregnancy, the use of contraception, and sexually transmitted infections. The final sessions discussed different types of violence directed against women, including physical emotional, sexual, and economic abuse, and provided guidance on how women could seek help and protect themselves against such violence. Taken together, the reproductive health empowerment program aimed at both giving the young women new opportunities (by providing them with knowledge about how to protect themselves in sexual practices and relationships) and greater decision-making power (by making them more confident in their own sexuality and aware of their right to control their own body).

To strengthen the external validity and scalability of the interventions (Al-Ubaydli et al., 2017), the empowerment programs were implemented by local teachers at the schools. The selection of the teachers was made by asking the women at baseline to name two teachers they trusted and could talk with, and then the school principals appointed teachers for the program based on these recommendations. The selected teachers attended a one-week instructor session organized by Femina HIP (two weeks for teachers involved in the Combined treatment arm). Both empowerment programs were accompanied with a booklet designed specifically for this training, *Build your life* and *Protect your life*, that also provided homework asking the participants to relate the training to their own life situation, and a facilitator guide for the teachers.

3.3 Data.

We here provide an overview of the follow-up data used in the main analysis, collected across the three rounds (short, medium and long term); see also Online Appendix C for a complete list of variables.

Figure 2 shows the timeline of the data collection. The baseline survey was conducted in the second quarter of 2013, and the interventions were implemented in the third quarter of 2013. We implemented a short-term follow-up survey and a lab-in-the field experiment a few weeks after the empowerment programs ended. The medium- and long-term data

follow-up, which included the collection of the survey data, the incentivized experimental data, and the medical data, were implemented one year and three to four years later, with the data collection ending in the third quarter of 2017.[4] In all the follow-up rounds, we collected data on the main outcome variables in the economic and health domains and additional variables that could shed light on behavioral changes and their impact on the well-being of the women. Overall, we surveyed 98.88 percent of the participants at least once after the interventions (3,444 out of 3,483 participants). In Table A1 in Online Appendix A, we show that the rates of attrition in the different follow-up rounds do not differ significantly across treatments.
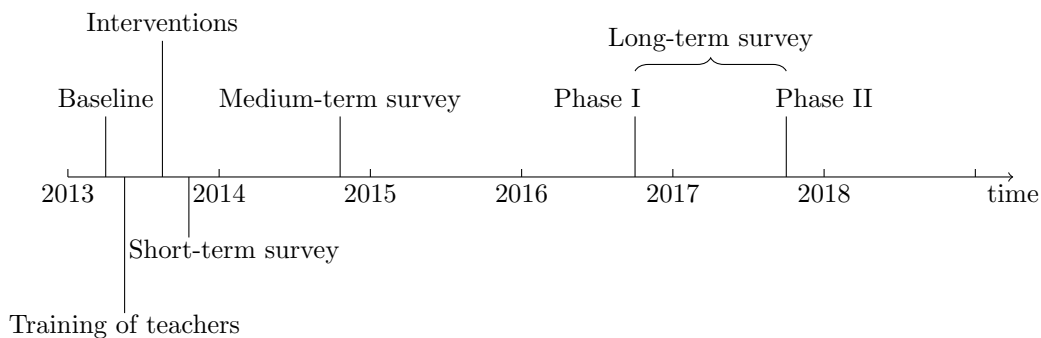
Figure 2: Timeline

The main outcome variables are *Self-employment*, *Business income*, and *Total income* in the economic domain, and *Teenage pregnancy* and *Started childbearing* in the reproductive health domain. A participant is self-employed if she reports having her own income-generating activity, which includes cultivating her own plot of land, rearing poultry or livestock, or other businesses. Business income is measured as the reported sales, from these activities in a normal week, while total income also includes weekly earnings from all other economic activities (mostly work in the family business or other salaried

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[4]The short-term data collection was implemented at the schools. The medium-term data collection was implemented by phone interview, given that most women were out of school at that time. The long-term data collection was implemented in two steps in collaboration with the data collection company EDI Global, which organized the surveys and the medical testing. First, the participants were contacted by phone to obtain information about their new place of residence and to administer an initial interview by phone. Second, based on the initial interviews, we selected 21 sites and invited the participants to a face-to-face interview and the medical testing (rapid diagnostic tests of pregnancy, syphilis and malaria) at the site closest to their location. Each site was staffed by a team consisting of a supervisor, two interviewers, two nurses and a lab technician. The National Institute of Medical Research of Tanzania approved the medical testing procedures. By the end of 2016, we were able to interview 88 percent of the baseline sample on the phone and 72 percent face to face. To reduce the attrition rate further, we organized a second phase in the third quarter of 2017 to find and meet the participants that we missed in 2016. We interviewed 394 additional participants in this second phase, which implies that we reached 83 percent of the women in a face to face interview in the long-term follow-up.

employement). Teenage pregnancy is defined as a participant giving birth before she is 20 years old, the definition used by the World Health Organization. A participant has started childbearing if she is pregnant at the time of the survey or already has a child. Deliveries and pregnancies are self-reported in the medium- and long-term surveys, but we also performed a medical test of pregnancy in the long-term follow-up.

When analyzing the mechanisms, we start by studying the short-term effects of the interventions on the participants' knowledge, preferences, and decision-making power. In the short-term survey, we measured knowledge in the economic domain (*Business Knowledge*) and the health domain (*Health Knowledge*), using incentivized multiple choice questions where the participants earn 100 Tanzanian shillings (TZS) for each correct answer.[5] In terms of preferences, we measured risk aversion (*Risk Averse*) using a survey question about the general willingness to take risks in life (Dohmen et al., 2011), time preferences (*Patience*) by asking participants hypothetically to choose between waiting for one month and receiving TSZ 20,000 or receiving TSZ 10,000 today, and competitiveness preferences (*Competitiveness*) by whether they chose competition or a fixed payment in an incentivized lab-in-the-field tournament (Niederle and Vesterlund, 2007). Decision-making power was measured both in terms of self-control and gender equality attitudes. The self-control measure (*Self-control*) is an index based on seven different questions selected from the "psychological coping resources measure" in Pearlin and Schooler (1978). Gender equality attitudes (*Gender equality*) are measured in both the economic domain (the degree to which the participant finds it acceptable that the wife earns more money than the husband) and the health domain (the number of different situations in which the participant finds wife beating unacceptable, 0–5).[6] We also construct an overall index of decision-making power aggregating the responses on self-control and gender equality. Finally, we examine whether the interventions affected the participants' plans for the future by asking whether they planned to continue studying (*Keep studying*), had business plans (*Set up a business*), and at what age they would like to get married (*Age at marriage*) and have their first child (*Age at first birth*).

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[5]At the time of the baseline survey, the PPP conversion factor to one USD was equal to TZS 681.66, `https://data.worldbank.org/indicator/PA.NUS.PRVT.PP?locations=TZ-US`.

[6]The gender equality measure in the health domain is taken from the Demographic and Health Surveys (DHS) (`https://dhsprogram.com/`), and has been extensively used to measure women's empowerment and gender equality (see, for instance, Ewerling et al. (2017, 2020)).

In the medium-term survey, we focused on the participants' behavior in the economic and health domains. In the economic domain, we asked what their main occupation was and code it in the following categories: attending school or training (*Student*); self-employed in non-agricultural business (*Non-agriculture*), land cultivation (*Land*), and livestock rearing (*Livestock*); formal employment or working informally for someone else (*Salaried employment*); helping out in the family business (*Family business*); domestic work at home (*Domestic chores*). In the health domain, we asked the participants if they were in a relationship, including being married, engaged, living together or having a boyfriend (*Relationship*) and if they received money from a boyfriend (*Money from boyfriend*). Finally, we measured whether they had migrated by recording their current place of residence and comparing it to their baseline location (*Migrated*).

In the long-term survey, we measured the participants' well-being in the health dimension by medically testing them for syphilis (*Syphilis*) and malaria (*Malaria*), and by using screening questions about symptoms of sexually transmitted diseases (*Health index*). Further, to obtain a general measure of how the interventions affected the participants' well-being, we asked them in all follow-up rounds to respond to the statement "I am very happy with my life" (*Happiness*), on a scale from 1 (strongly disagree) to 5 (strongly agree).

3.4   Empirical approach.

We here provide an overview of the empirical approach used in the main analysis. To study the causal effect of the different interventions on outcome Y_{ij} of individual i from school j, we estimate the intention to treat estimators (ITT) using the following ordinary least squares (OLS) regression:

$$Y_{ij} = \alpha + \beta_1 E_j + \beta_2 H_j + \beta_3 EH_j + \gamma X_{ij} + \epsilon_{ij}, \tag{1}$$

where E_j, H_j, and EH_j are indicator variables equal to one if school j is assigned to the Economic, SRH, or Combined treatment arms, respectively. X_{ij} is a vector of pre-specified covariates from the baseline survey. We cluster the standard errors at the school

level.

In this analysis, the estimated values of β_1, β_2, and β_3 capture the causal effects of the different interventions. We test whether there is a (positive or negative) complementarity between the two empowerment programs by comparing the estimated causal effect of the Combined treatment arm (β_3) with the sum of the estimated causal effects of the Economic and SRH treatment arms ($\beta_1 + \beta_2$). We further report tests of whether there are significant differences in the estimated causal effects of the different treatment arms.

We prespecified to test for heterogeneity across four dimensions: age and cognitive ability at the individual level, wealth at the household level, and remoteness at the school level.

The heterogeneous effects are estimated using the following OLS regression:

$$
\begin{aligned}
Y_{ij} =& \eta + \theta_1 E_j + \theta_2 H_j + \theta_3 EH_j + \lambda Z_{ij} \\
& + \theta_4 E_j \times Z_{ij} + \theta_5 H_j \times Z_{ij} + \theta_6 EH_j \times Z_{ij} + \kappa X_{ij} + \zeta_{ij},
\end{aligned}
\tag{2}
$$

where Z_{ij} is an indicator variable for the respective heterogeneity (age, cognitive ability, wealth, remoteness) and $T_j \times Z_{ij}$ is the heterogeneity indicator variable interacted with the treatment indicator $T_j = E_j, H_j, EH_j$. The estimated causal treatment effects for two subgroups characterized by $Z_{ij} = 1$ and $Z_{ij} = 0$ are given by $(\theta_1 + \theta_4)$ and (θ_1) for the Economic treatment arm, $(\theta_2 + \theta_5)$ and (θ_2) for the SRH treatment arm, and $(\theta_3 + \theta_6)$ and (θ_3) for the Combined treatment arm. The estimated differences in the treatment effects between two subgroups are given by of θ_4, θ_5, and θ_6.

We adjust the *p-values* for multiple hypothesis testing, following the procedure in Benjamini and Hochberg (1995) to control for the false discovery rate. We explain the procedure and the construction of the families in Appendix D. In the tables, we define the families and report the results of hypothesis tests using both unadjusted (using the asterisk $*$ symbol) and adjusted *p-values* (using the star $\star$ symbol).

Finally, in the mechanism discussion, we estimate and report the associations between the fertility outcomes and the individual measures of income, decision-making power and

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relationship status. These associates are estimated by OLS regressions, controlling for treatment assignment and the same set of baseline covariates as in the main analysis.

4 Results.

This section presents the main findings from the study. We first consider how the interventions affected the income and fertility of the participants over time. Then, we provide evidence on the underlying mechanisms that may contribute to explaining the effects in the economic and reproductive health domains.

4.1 Main results.

The economic empowerment program had a strong focus on the opportunities for self-employment, while the risk of teenage pregnancy was a key part in the reproductive health empowerment program. We therefore begin by considering how the interventions affected self-employment and teenage pregnancy, before we return to a broader discussion of the effects in the economic and reproductive health domains.

In Figure 3, we show the proportions of self-employed participants (left panel) and of teenage pregnancies (right panel), by treatment arm and time horizon. We observe, in the left panel in Figure 3, that very few participants had income-generating activity in the baseline survey and in the short term when they were still in school. However, already in the short term we find that participants who received the economic empowerment program are more likely to be self-employed than the other participants: about seven percent of the participants are self-employed in the Economic treatment arm and in the Combined treatment arm, compared with about three percent in the SRH treatment arm and the control group. In the medium and long term, we observe a general increase in the proportion of self-employed participants, but there are still large treatment effects on self-employment from the economic empowerment program. One year after the intervention, 31 percent of participants in the Economic treatment arm and 36 percent of participants in the Combined treatment arm are self-employed, compared with 23 percent of participants

in the SRH treatment arm and 19 percent in the control group. Three to four years after the intervention, we again observe the highest proportion of self-employment among those who received the economic empowerment program: 38 percent in the Economic treatment arm and 41 percent in the Combined treatment arm, compared with 33 percent in the SRH treatment arm and 29 percent in the control group. Hence, we consistently observe across the different follow-up rounds that the proportion of self-employed women is highest among participants who received the economic empowerment program. Compared with the control group, we also observe a somewhat higher proportion of self-employed women among the participants who only received the reproductive health empowerment program, but the proportion of self-employed women in this arm is, in all follow-ups, significantly lower than among those that received the economic empowerment program.

The right panel in Figure 3, shows that there were no teenage pregnancies at the baseline in our sample, in line with the national policy at the time of the study that pregnant women were not allowed in school. Over time, we observe that some participants have started childbearing as a teenager, with the proportion of teenage pregnancies being greater in the treatment arms than in the control group, both in the medium and long term. The difference in teenage pregnancies is particularly pronounced in the long term. Three to four years after the intervention, we observe the greatest prevalence of teenage pregnancies, about 17 percent, in the Economic treatment arm. However, we also observe a larger proportion of teenage pregnancies among the participants who received the reproductive health empowerment program compared with the control group: about 14 percent in the SRH and Combined treatment arms versus 9 percent in the control group.

In Table 2 and Table 3, we report the regression analysis of the effects of the interventions in the economic and reproductive health domains, with prespecified controls and standard errors clustered at the school level. Table 2 reports the effects on self-employment, business income, and total income.[7] Columns (1)–(3) show that the effect on self-employment is significant for both the Economic and the Combined treatment arms in all follow-up rounds, while there is no significant effect on self-employment from the SRH treatment arm. In columns (4)–(6), and consistent with the patterns we observe for self-employment, the economic empowerment program resulted in a significant increase in business income

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[7]We use total reported sales as measure of business income, as pre-specified. In the medium-term, we also measured business profits. The estimated treatment effects on profits are very similar in size to the effects on sales.
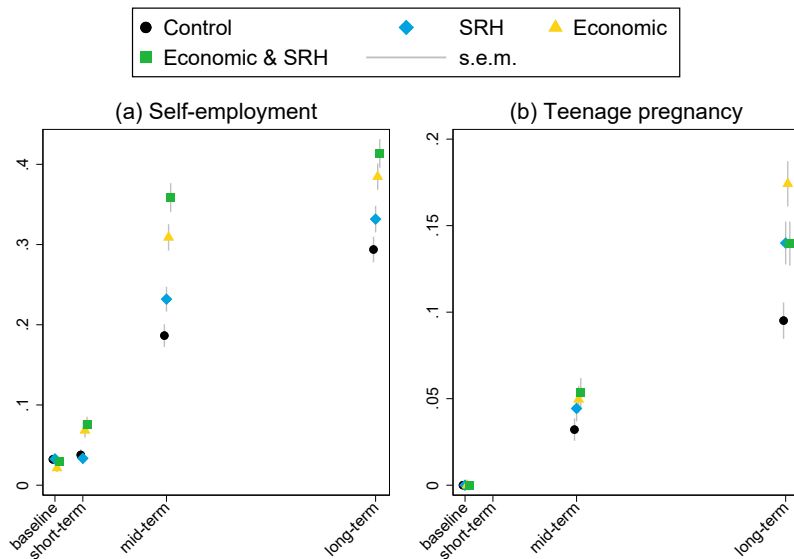
Note: The figure shows the proportion of self-employed participants (Panel (a)) and the proportion of teenage pregnancies in the sample (Panel (b)), by treatment arm and time horizon. We did not collect data on pregnancy in the short-term follow-up.

Figure 3: Self-employment and teenage pregnancy

in all follow-up rounds. The effects on business income are substantial, we observe an increase in business income in both the Economic and Combined treatment arms of about 80 percent in the long term compared with the control group. We also observe an increase in business income in the SRH treatment arm of about 20 percent, but the effect is not statistically significant.

In the medium and long term, we collected detailed data on the total income of the participants, including business income and all other sources of income. We observe in columns (7)–(8) in Table 2 that the effects on the total income mirror the effects on business income. The Economic treatment arm and the Combined treatment arm cause a large increase in total income of 80–100 percent, unlike the SRH treatment arm that results in no significant increase in total income. In the long term, the total monthly income of the participants in the control group is TZS 7,732 (winsorized at the 99th percentile), which is comparable to the average income per capita among the poorest 40 percent of the population in Tanzania.[8] The poverty line for Tanzania is TZS 49,320 per adult per month (World Bank), which implies that 82 percent of the participants in the

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[8]The average income per capita of the poorest 40 percent in Tanzania is USD 1.18 PPP per day (World Bank, Global Database of Shared Prosperity, worldbank.org/en/topic/poverty/brief/global-database-of-shared-prosperity). If we use the 2016 conversion factor, this is equivalent to an average weekly income of TZS 6,076.

Table 2: Impact on economic outcomes

	(1) Self-employment	(2)	(3)	(4) Business income (ihst)	(5)	(6)	(7) Total income (ihst)	(8)
	short term	medium term	long term	short term	medium term	long term	medium term	long term
Economic	.033**	.115***	.093**	.288**	.721***	.796**	.81***	.82***
	(.014)	(.032)	(.036)	(.116)	(.263)	(.305)	(.301)	(.305)
SRH	-.003	.038	.036	-.01	.284	.24	.206	.297
	(.009)	(.025)	(.032)	(.086)	(.201)	(.298)	(.28)	(.296)
Econ. & SRH	.039**	.167***	.118***	.36**	1.157***	.83**	1.086***	.978***
	(.017)	(.038)	(.032)	(.155)	(.326)	(.323)	(.356)	(.333)
Tests of equality of coefficients:								
Econ. - SRH	.035**	.077**	.057*	.299**	.436*	.556**	.604*	.524**
	(.014)	(.03)	(.031)	(.12)	(.261)	(.251)	(.341)	(.257)
Econ. - Econ. & SRH	-.006	-.052	-.025	-.072	-.437	-.034	-.277	-.158
	(.02)	(.042)	(.033)	(.174)	(.385)	(.298)	(.427)	(.315)
SRH - Econ. & SRH	-.041**	-.129***	-.083***	-.371**	-.873**	-.59**	-.88**	-.681**
	(.018)	(.037)	(.028)	(.163)	(.335)	(.288)	(.401)	(.302)
SRH + Econ. - Econ. & SRH	-.008	-.014	.01	-.083	-.152	.206	-.071	.139
	(.022)	(.049)	(.047)	(.198)	(.443)	(.432)	(.518)	(.44)
Mean Control	.038	.187	.294	.344	1.162	2.359	2.547	2.542
Obs.	2895	2994	3249	2895	2994	3249	2992	3252

Note: The table provides OLS estimates of the treatment impacts ("Economic", "SRH" and "Econ. & SRH"), tests of equality of impacts between treatment arms ("Econ. - SRH", "Econ. - Econ. & SRH" and "SRH - Econ. & SRH"), and a test of complementarity between the economic empowerment program and the reproductive health empowerment program ("SRH + Econ.- Econ. & SRH"). The standard errors, in parentheses, are clustered at the school level (unit of randomization). Statistically significant differences between the estimates and zero are indicated by $* \ p < 0.1$, $** \ p < 0.05$, $*** \ p < 0.01$ when the p-values are not corrected and by $\star \ p < 0.1$, $\star\star \ p < 0.05$, $\star\star\star \ p < 0.01$ when the p-values are corrected for multiple hypothesis testing. The correction considers all the outcomes in this table to be part of the same family. All the estimations include the covariates listed in Table 1. "ihst" indicates that we use the inverse hyperbolic sine transformation of the variable.

control group live in economic poverty. We observe a significant reduction of about four percentage points in the proportion of women living in economic poverty in the Economic treatment arm ($p = 0.061$) and of about six percentage points in the Combined treatment arm ($p = 0.012$), but no significant effect on the poverty rate in the SRH treatment arm.

In the bottom panel in Table 2, we report tests on the differences in effects between the treatment arms in the economic domain. In most comparisons, the effects on self-employment, business income, and total income are significantly larger in the Economic and Combined treatment arms than in the SRH treatment arm. We do not observe any significant differences between the Economic and Combined treatment arms, and no significant complementarities between the reproductive health empowerment and the economic empowerment programs (comparing the sum of the effects from the Economic and SRH treatment arms with those of the Combined treatment arm).

We next consider how the interventions affected fertility. In Figure 4, we provide the distribution of age at first birth, which ranges from 16 years to 26 years. Table 3 reports
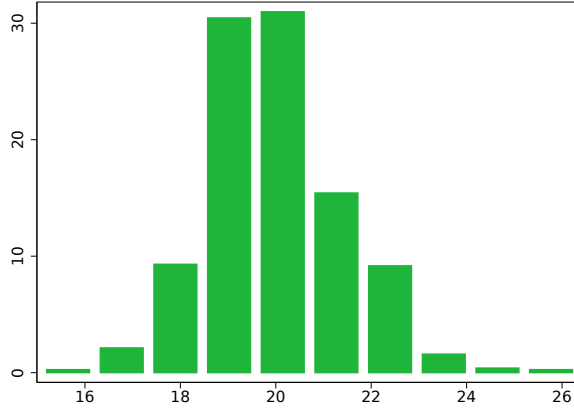
Note: *The figure shows the distribution of age at first birth in the full sample among those that had started childbearing in the long term. Age is on the horizontal axis and the vertical axis shows the corresponding percentage of the full sample that had their first birth at this age.*

Figure 4: Age at first birth.

the regression analysis of the treatment effects on indicators for teenage pregnancy and having starting childbearing. The regression analysis only covers the medium term and the long term, since the women were still in school in the short term and had not started childbearing. We do not report any analysis of how the interventions affected the number of children, as only 0.8 percent of the women have more than one child in the long term.

Table 3: Impacts on fertility.

	(1) Teenage pregnancy	(2) Started childbearing	(3)
	long term	medium term	long term
Economic	.087***	.008	.056*
	(.019)	(.014)	(.028)
SRH	.048***	.008	.051*
	(.018)	(.017)	(.027)
Econ. & SRH	.052***	.021	.025
	(.019)	(.017)	(.03)
Tests of equality of coefficients:			
Econ. - SRH	.039*	-.001	.005
	(.02)	(.015)	(.022)
Econ. - Econ. & SRH	.035	-.013	.031
	(.023)	(.016)	(.027)
SRH - Econ. & SRH	-.004	-.012	.026
	(.021)	(.018)	(.026)
SRH + Econ. - Econ. & SRH	.083***	-.005	.082**
	(.029)	(.023)	(.039)
Mean Control	.095	.056	.326
Obs.	3142	2993	3262

Note: *See Table 2 for variable definitions. The multiple hypothesis testing correction considers all the outcomes in this table to be part of the same family.*

Column (1) in Table 3 shows that 9.5 percent of the women in the control group had a

teenage pregnancy in the long term, which amounts to about 30 percent of the women who had started childbearing. We estimate a significantly higher prevalence of teenage pregnancy in all the treatment arms compared with the control group: almost a doubling of the proportion of teenage pregnancies in the Economic treatment arm, and about a 50 percent increase in teenage pregnancies in the SRH and Combined treatment arms.

In columns (2)–(3), we observe a sharp increase over time in the overall proportion of participants who have started childbearing in the control group, in line with the aggregate fertility pattern in Tanzania. In the control group, 5.6 percent have started childbearing in the medium term, and 32.6 percent in the long term. The long-term fertility rate is close to the national average in Tanzania for 20-year-old women who have completed secondary school (35 percent according to our own calculations using the DHS 2016). We estimate a causal effect on the proportion of women who started childbearing of about 15 percent for both the SRH treatment arm and the Economic treatment arm, both in the medium and long term. The estimated effects are statistically significant in the long term. The estimated effect of the Combined treatment arm on childbearing is smaller in magnitude and not statistically significant in the medium term or long term.

In the bottom part of Table 3, we show that there is a significant negative complementarity between the two empowerment programs on both fertility outcomes in the long term: the estimated causal effects for the Combined treatment arm are significantly smaller than the sum of the estimated effects for the Economic and SRH treatment arms. We return to this result in detail in the next section.

Following our pre-analysis plans, we have also examined whether the treatment effects in the long term depend on school (remoteness), family (wealth), and individual characteristics (cognitive ability, age). In both the economic and health domains, the treatment effects are consistent across subgroups and in line with the estimated average treatment effects, as shown in Online Appendix E. In the economic domain, we observe an increase in self-employment, business income, and total income in all subgroups in the Economic and Combined treatment arms, and these effects are more pronounced than in the SRH treatment arm. In the reproductive health domain, we observe an increase in teenage pregnancy and having started childbearing in (almost) all subgroups in all treatment arms. Overall, there are no statistically significant differences in the treatment effects

across these subgroups.

4.2   Mechanisms.

We here provide a discussion of the mechanisms that may explain the observed findings in the economic and reproductive health domains. We first analyze how the interventions affected the knowledge, preferences, decision-making power, and plans of the women in the short term, before we consider behavioral changes in the medium term. We close this discussion by examining how the different mechanism variables relate to long-term income and teenage pregnancy.

In Table 4 and Table 5, we provide evidence on how the interventions affected the women in the short term, measured a few weeks after the empowerment programs concluded. In columns (1)–(2) in Table 4, we report the results from an incentivized test that we implemented to study whether the women had more business knowledge and reproductive health knowledge after having taken part in the programs. An aim of the economic empowerment program was to provide the women with more knowledge about how to identify business opportunities, the resources needed to operate a business, marketing, customer service, and various other aspects related to being self-employed. As seen from column (1), we find evidence of an increase in business knowledge from the economic empowerment program: the share of correct answers increases by about three percentage points in the Economic treatment arm and by about six percentage points in the Combined treatment arm. The effect size is not large, but shows that the economic empowerment program indeed provided some new business knowledge to the women. As expected, there is no effect on business knowledge from the reproductive health empowerment program, which did not cover the business topics. We note from the bottom panel that the estimated treatment effect on business knowledge for the Economic treatment arm and the Combined treatment arm are significantly larger than for the SRH treatment arm.

Column (2) shows that there is no effect of any of the interventions on reproductive health knowledge. We note that the control group answered about 70 percent of the reproductive health questions correctly, which suggests that the women were quite informed about the health issues covered in the reproductive health empowerment program. Entrepreneurship

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was a more novel topic for the students. It was not covered by the school curriculum, and the control group performed significantly worse on the business knowledge test than on the health knowledge test, correctly answering only about 40 percent of the questions.

The empowerment programs might also affect the mindset of the participants, and in columns (3)–(5) in Table 4 we report the effects on their decision-making power, both in terms of perceived self-control and gender equality attitudes. We find strong evidence of the health program (alone or in the combined treatment) providing the women with greater perceived self-control and more gender equal attitudes, while the economic program only had a strong effect on gender equality attitudes in the economic domain. The bottom panel shows that the two types of programs had significantly different effects on gender equality attitudes in their respective domains. Moreover, the Combined treatment arm had a stronger effect on perceived self-control than the Economic treatment arm. In columns (6)–(8), we consider whether the empowerment programs changed the women's risk, time, and competitiveness preferences. Column (6) shows a strong positive effect (around 0.3 standard deviations) of the economic empowerment program on the willingness to take risk, which likely reflects that the economic empowerment program focused on the role of calculated risk in self-employment. We do not find any effect on the risk preferences from the reproductive health empowerment program, and, as shown in the bottom panel, the estimated treatment effect on risk preferences for the Economic and Combined treatment arms are significantly larger than for the SRH treatment arm. We do not find average treatment effects on the time and competitiveness preferences from the economic empowerment program or from the reproductive health empowerment program.

In Table 5, we report how the interventions affected the plans of the women. The empowerment programs had no significant effects on the plans for studying (column (1)), when to get married (column (3)) or when to have a first child (column (4)). As seen from the means for the control group, most women did plan to continue studying and planned to get married and have a baby when they were around 26 years old. However, we find a large and highly significant effect of the economic empowerment program on the plans for setting up a business (column (2)).

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health questions correctly, which suggests that the women were quite informed about the health issues covered in the reproductive health empowerment program. Entrepreneurship was a more novel topic for the students. It was not covered by the school curriculum, and the control group performed significantly worse on the business knowledge test than on the health knowledge test, correctly answering only about 40 percent of the questions.

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The last row in the bottom panels in Table 4 and Table 5 shows no evidence of a complementarity between the reproductive health empowerment program and the economic empowerment program on any of the dimensions. Hence, it appears that offering both programs to the women did not affect the effectiveness of either of the programs, which suggests that the negative complementarity between the two programs in terms of teenage pregnancy and childbearing is not due to any implementation synergies.

In Table 6, we examine how the interventions affected the behavior of the women about one year after the empowerment programs had ended. Column (1) shows that the empowerment programs had no impact on the proportion of women studying, in line with the absence of an effect on study plans observed in Table 5. The proportion of women studying in the medium term is significantly lower than that of women who stated that they planned to keep studying immediately after the programs, which reflects the limited educational opportunities for these women. Only six percent of the women passed the Form IV exam, and we do not find any effect of the interventions on the likelihood of passing. The large majority of the women who reported studying in the medium term attended vocational training programs, while a minority repeated parts of secondary school or prepared for another attempt to pass the Form IV exam. In columns (2)–(6), we provide a disaggregated picture of how the interventions affected the choice of occupation. The economic empowerment program, in both the Economic and the Combined treatment arms, had significant effects on non-agricultural and agricultural self-employment, but we do not find that the increase in self-employment crowds out the extent to which the women earn wage income or are involved in the family business or domestic chores. The reproductive health empowerment program had no impact on the choice of occupation. Columns (8)–(9) show that the reproductive health empowerment program, but not the entrepreneurship empowerment program, affected the proportion of women having a relationship and receiving money from a boyfriend. We observe a 25 percent increase in the proportion of women having a partner in the SRH treatment arm and in the Combined treatment arm compared with the control group, and a corresponding increase in the proportion of women receiving money from their boyfriend. The partners are 22 years old on average, but there is no treatment effect on the partner's age. Finally, we observe that none of the interventions affected the likelihood that the women had migrated one year after the intervention.

In the bottom panel in Table 6, we show that the effects on the choice of occupation are significantly larger for the economic empowerment program than the reproductive health empowerment program, while the effects on the relationship variables are significantly larger from the reproductive health empowerment program than from the economic empowerment program. We find no evidence of a complementarity between the reproductive health empowerment program and the economic empowerment program in how they affected behavior in the medium term.

The findings in Tables 4–6 provide a consistent picture of how the economic empowerment program caused an increase in the women's income. The economic empowerment program made them plan to start a business, likely reflecting that they had more knowledge about how to operate a business, were more willing to take risks, and had internalized gender equality in the economic domain. Many of the women carried through with their plans of starting a business: 34 percent were self-employed in the medium term compared with 22 percent among those women who did not plan to start a business. The increase in self-employment did not crowd out other occupations in the medium term, and thus likely increased their total income by causing an increase in income-generating activities. In the long term, we find some evidence of the increase in self-employment leading to a reduction in salaried employment and domestic chores, which likely reflects a profitable reallocation of occupations as we observe that the average income from self-employment is around 50 percent higher than for salaried employment in the control group.

The long-term effects on fertility reported in Table 3 are more involved, as we observe an increase in fertility from both empowerment programs, without strong complementarities between the programs. In Table 7, we assess how teenage pregnancy and having started childbearing in the long term relate to key variables that were moved by the treatments in the short and medium term: having an income, being in a relationship, and decision-making power. The analysis in Table 7 cannot identify causal relationships, but may shed some light on the underlying mechanisms driving the observed changes in fertility. In columns (1)–(2), we show that long-term fertility is significantly positively related to the women having an income in the medium term, consistent with the economic empowerment program causing an increase in fertility through a positive income effect. Columns (3)–(4) show a strong and positive association between fertility and being in a relationship in the medium term, consistent with the reproductive health empowerment program causing

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an increase in fertility through a positive relationship effect. Finally, columns (5)–(6), show that women with more decision-making power in the short term are less likely to be pregnant during their teenage years and to have started childbearing in the long term, indicating that increased decision-making partly counteracts the income and relationship effects induced by the empowerment programs.

Table 4: Short term: impacts on knowledge, preferences, and decision-making power.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Knowledge			Decision-making power				Preferences	
	Business	Health	Self-control	Gender equality		Index	Willingness to	Patience	Competitiveness
				Economic	Health		take risks		
Economic	.033*** ⋆⋆	.003	.057	.297***	-.089	.059	.307*** ⋆⋆⋆	-.028	.063
	(.011)	(.017)	(.041)	(.079)	(.07)	(.036)	(.066)	(.026)	(.048)
SRH	0	.004	.126*** ⋆⋆	.136*	.279*** ⋆⋆⋆	.116*** ⋆⋆⋆	-.003	.02	-.027
	(.012)	(.018)	(.047)	(.077)	(.097)	(.036)	(.071)	(.029)	(.057)
Econ. & SRH	.062*** ⋆⋆⋆	.016	.181*** ⋆⋆⋆	.302*** ⋆⋆⋆	.314*** ⋆⋆⋆	.174*** ⋆⋆⋆	.249*** ⋆⋆⋆	.03	.01
	(.014)	(.017)	(.051)	(.076)	(.088)	(.038)	(.065)	(.027)	(.044)
Tests of equality of coefficients:									
Econ. - SRH	.032** ⋆⋆	-.001	-.069	.161** ⋆	-.367***	-.057	.31*** ⋆⋆⋆	-.048*	.089
	(.012)	(.014)	(.05)	(.071)	(.091)	(.037)	(.075)	(.027)	(.061)
Econ. - Econ. & SRH	-.029** ⋆	-.013	-.124** ⋆	-.005	-.403*** ⋆⋆⋆	-.115*** ⋆⋆	.059	-.057**	.053
	(.014)	(.014)	(.055)	(.073)	(.088)	(.043)	(.065)	(.027)	(.048)
SRH - Econ. & SRH	-.061*** ⋆⋆⋆	-.013	-.055	-.166** ⋆	-.036	-.058	-.252*** ⋆⋆⋆	-.01	-.037
	(.015)	(.016)	(.058)	(.07)	(.108)	(.042)	(.073)	(.028)	(.059)
SRH + Econ. - Econ. & SRH	-.029	-.009	.002	.131	-.124	.001	.056	-.038	.026
	(.018)	(.024)	(.072)	(.107)	(.132)	(.057)	(.096)	(.04)	(.074)
Mean Control	.38	.684	-2.477	3.817	3.578	.411	0	.383	.332
Obs.	2898	2898	2891	2895	2890	2886	2895	2895	2912

Note: See Table 2 for variable definitions. The multiple hypothesis testing correction considers all the outcomes in this table to be part of three different families: (i) Knowledge, (ii) Preferences, and (iii) Decision-making power. The decision-making power index is a binary variable equal to one if the respondent is above the median in the sample on a principal component index based on the three decision-making variables (Self-control, Gender equality - Health/Economic).

Table 5: Short term: impacts on plans for the future.

	(1) Keep studying	(2) Set up a business	(3) Age at marriage	(4) Age at first birth
Economic	.045	.378***	.15	.19
	(.052)	(.039)	(.248)	(.245)
SRH	-.023	.022	.161	-.002
	(.053)	(.028)	(.217)	(.23)
Econ. & SRH	.039	.432***	.085	.03
	(.048)	(.046)	(.226)	(.221)
Tests of equality of coefficients:				
Econ. - SRH	.068	.356***	-.011	.192
	(.051)	(.039)	(.247)	(.261)
Econ. - Econ. & SRH	.005	-.055	.065	.161
	(.047)	(.054)	(.246)	(.243)
SRH - Econ. & SRH	-.062	-.41***	.076	-.031
	(.049)	(.047)	(.225)	(.243)
SRH + Econ. - Econ. & SRH	-.018	-.033	.226	.159
	(.072)	(.061)	(.329)	(.338)
Mean Control	.694	.151	25.6	26.7
Obs.	2892	2894	2895	2863

Note: See Table 2 for variable definitions. The multiple hypothesis testing correction considers all the outcomes in this table to be part of the same family.

Table 6: Behavior in the medium term.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
				Occupations				Relationship	Money from	Migrated
	Student	Self-employed			Salaried employment	Family	Domestic		boyfriend	
		Non-agri.	Land	Livestock	worker	business	chores			
Economic	-.041	.066**	.03*	.066**	-.009	.04	.003	-.006	-.005	.031
	(.03)	(.025)	(.017)	(.029)	(.023)	(.03)	(.007)	(.024)	(.028)	(.047)
SRH	-.008	.018	.011	.02	-.01	.049	-.003	.086$^{**}_{\star}$	.07$^{**}_{\star}$	.009
	(.031)	(.022)	(.016)	(.023)	(.025)	(.034)	(.009)	(.035)	(.031)	(.048)
Econ. & SRH	-.005	.111$^{***}_{\star\star}$	.043**	.068**	-.027	.031	-.014	.082$^{***}_{\star\star}$	.056*	.037
	(.04)	(.034)	(.018)	(.03)	(.026)	(.032)	(.011)	(.029)	(.031)	(.043)

Tests of equality of coefficients:

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Econ. - SRH	-.034	.047*	.019	.045**	.001	-.009	.006	-.093$^{***}_{\star\star}$	-.076$^{**}_{\star}$	.022
	(.029)	(.025)	(.022)	(.022)	(.021)	(.032)	(.009)	(.033)	(.034)	(.05)
Econ. - Econ. & SRH	-.036	-.045	-.013	-.002	.019	.009	.017	-.089$^{***}_{\star\star\star}$	-.061*	-.006
	(.04)	(.037)	(.023)	(.03)	(.022)	(.031)	(.012)	(.027)	(.033)	(.045)
SRH - Econ. & SRH	-.003	-.092***	-.032	-.047*	.018	.018	.012	.004	.014	-.028
	(.041)	(.035)	(.023)	(.025)	(.023)	(.035)	(.013)	(.038)	(.036)	(.047)
SRH + Econ. - Econ. & SRH	-.044	-.027	-.002	.018	.009	.058	.015	-.002	.009	.003
	(.052)	(.044)	(.028)	(.038)	(.033)	(.046)	(.015)	(.045)	(.045)	(.066)
Mean Control	.319	.079	.052	.086	.165	.655	.972	.34	.297	.316
Obs.	2993	2994	2994	2994	2990	2994	2994	2993	2963	2994

Note: See Table 2 for variable definitions. The multiple hypothesis testing correction considers the outcomes in this table as three different families: (i) Occupations, (ii) Relationship and Money from a boyfriend, and (iii) Migrated.

Table 7: Correlates of teenage pregnancy and started childbearing: Income, relationship, and decision-making power.

	Teen (1)	All (2)	Teen (3)	All (4)	Teen (5)	All (6)
Has income	0.070*** (0.014)	0.083*** (0.018)				
In a Relationship			0.144*** (0.014)	0.236*** (0.016)		
Decision-making power					-0.024* (0.012)	-0.064*** (0.018)
Observations	2770	2872	2772	2874	2647	2734
R-sq.	0.03	0.03	0.06	0.07	0.02	0.03

Note: The table provides OLS estimates of the correlation between teenage pregnancy (Teen) or started childbearing (All) in the long term and having income in the medium term, being in a relationship in medium term, and decision-making power in the short term. "Has income" is an indicator equal to one if the participant has her own income. "In a relationship" is an indicator equal to one if she is in a relationship. "Decision-making power" is an index of locus of control and gender equality in the health and economic domains (0-1). The estimations include the covariates listed in Table 1 and indicator variables for the treatment assignment. The standard errors, in parentheses, are clustered at the school level (unit of randomization. Statistically significant differences between the estimates and zero are indicated by * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The positive income effect is in line with recent research in the economics of fertility (Doepke et al., 2022), which argues that social norms, labor market flexibility, and partner characteristics can contribute to explain how an increase in income may increase fertility. We here discuss the extent to which these mechanisms may shed light on the income effect and the relationship effect in our study, see also Online Appendix G.

To provide evidence on the social norm mechanism, we asked the women in the long term survey whether (i) their parents would be happy and (ii) society would treat them with more respect if they became pregnant next year. They responded using a five points scale ranging from "strongly disagree" to "strongly agree". In Table 8, we report linear regressions where the dependent variable is an indicator variable for whether they agree that parents would be happy or society would treat them with more respect, on indicator variables for whether they have an income or are in a relationship.

In column (1), we show that there is a strong positive association between having income or being in a relationship and the women believing that their parents would be happy if they became pregnant next year. This association is robust to controlling for whether they have a child (which, as expected, has a negative effect), the set of background variables used in the main analysis, and treatment indicators. In column (2), we show that this

Table 8: Income, relationship and perceived social pressure.

	(1)	(2)	(3)	(4)
	If you were to have a child in the coming year:			
	Parents would be happy		Society would respect	
Has income	0.072***	0.111***	0.041*	0.079**
	(0.022)	(0.031)	(0.022)	(0.030)
In a relationship	0.160***	0.180***	0.169***	0.183***
	(0.020)	(0.024)	(0.021)	(0.024)
Has a child	-0.166***		-0.181***	
	(0.020)		(0.026)	
Constant	0.210***	0.166***	0.316***	0.337***
	(0.042)	(0.057)	(0.042)	(0.058)
Observations	2895	1861	2895	1861

The table provides OLS estimates of the correlation between the responses to the social pressure questions and having income and being in a relationship in the long term. The dependent variables are indicators equal to one if the participant strongly agrees that parents would be happy (columns (1) and 2)) or society would treat her with more respect (columns (3) and (4)), if she were to have a child in the following year. "Has income" is an indicator equal to one if the participant has her own income. "In a relationship" is an indicator equal to one if she is in a relationship. "Has a child" is an indicator equal to one if she has a child or is pregnant. We control for whether the women has a child in columns (1) and (3), and consider only the sample of childless participants in columns (2) and (4). The estimations include the baseline covariates listed in Table 1 and indicator variables for the treatment assignment. The standard errors, in parentheses, are clustered at the school level (unit of randomization). Statistically significant differences between the estimates and zero are indicated by $* p < 0.1$, $** p < 0.05$, $*** p < 0.01$.

association is also robust to only studying the subsample that does not already have a child in the long term. In columns (3) and (4), we show the corresponding analysis for how the women perceive expectations from society, where we observe positive associations between having income or being in a relationship and the women believing that society would treat them with more respect if they became pregnant next year. Taken together, the evidence shows that when women have an income or are in relationship, they perceive a stronger social pressure to have a child.

The extent to which social pressure affects the fertility decision depends on the weight that the women put on social pressure in their decision-making. We would therefore expect women with greater decision-making power to be less influenced by an increase in the social pressure to have a child when they have income or are in a relationship. In line with this, we show in Figure 5 that the income effect and the relationship effect are particularly salient among women with low decision-making power. The Figure reports the estimated income effect and relationship effect on fertility for participants with low and high decision-making power. We observe that among the participants with low decision-making power, having an income and being in a relationship are strongly positively correlated with both fertility measures (*p-value* below 0.001 for all four coefficients). In contrast, the

associations are weaker among the participants that have high decision-making power. In fact, in this group there is no significant association between income and teenage pregnancy. These differences suggest that decision-making power mediates the effects that higher incomes and relationships have on fertility.[9] Hence, the data provide evidence suggesting that social norms may contribute to explain both the income effect and the relationship effect: having income and being in a relationship increase the social pressure to have a child, which increases fertility among women with low decision-making power.

The negative association between decision-making power and fertility may also contribute to explain the observed negative complementarity in fertility between the two empowerment programs (Table 3). The fact that the women obtained greater decision-making power in the Combined treatment arm than in the Economic treatment arm, likely because they received empowerment training in both domains, may have placed the women in the Combined treatment arm in a better position than the women in the Economic treatment arm to overturn an increase in the social pressure to have a child generated by the positive income effect.

An important focus in the recent literature has been on how labor market flexibility may play a role in explaining fertility patterns (Bandiera et al., 2022; Doepke et al., 2022). It has been argued that the slower decline in fertility observed in Sub-Saharan Africa compared to the rest of the world may reflect that youth employment in this region is characterized by a high share of self-employment and a low share of salaried employment, where self-employment represents a more flexible labor arrangement than salaried employment that lowers the cost of having children (Zipfel, 2022). In our study, this should imply that the income effect on fertility should be stronger for women who have income from self-employment than for women who have income from salaried work.

To shed light on whether labor market flexibility may contribute to explain the positive income effect, we consider the relationship between fertility and having income separately for self-employed women and women with salaried employment, see Table G2 in the Online Appendix. We find strong evidence for the nature of the occupation being important for

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[9]The estimated interaction effect between having income and decision-making power on fertility is -0.085 (*p-value*=0.003) for teenage pregnancy and -0.073 (*p-value*=0.102) for having started childbearing. The estimated interaction effect between being in a relationship and decision-making power on fertility is -0.02 (*p-value*=0.49) for teenage pregnancy and -0.07 (*p-value*=0.046) for having started childbearing.
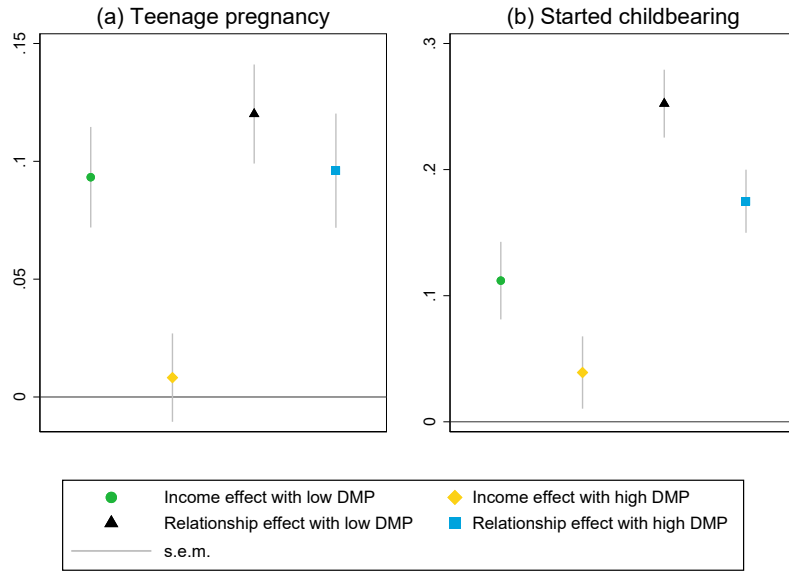
The figure provides OLS estimates of the correlation between teenage pregnancy or started childbearing in the long term and having an income and being in a relationship in medium term, for participants with low or high decision-making power (index of decision-making power below or above the median). All the estimations include the covariates listed in Table 1 and indicator variables for the treatment assignment. The standard errors are clustered at the level of randomization, the schools.

Figure 5: Decision-making power mediates the income and relationship effects.

the relationship between income and fertility. For self-employed women, there is a strong positive association between having income and fertility, both for teenage pregnancy and having started childbearing. On average, women who are self-employed in the medium term are 9.5 percentage points more likely to have a teenage pregnancy (*p-value* < 0.001) and 8 percentage points more likely to have a child in the long term (*p-value* < 0.001). In contrast, we do not find any significant associations between income and fertility for women who have income from salaried work.

Finally, we consider whether the empowerment programs caused women to have different partners than the control group, which also could have contributed to explain the income effect and the relationship effect (Ashraf et al., 2014, 2022; Doepke and Kindermann, 2019), see Table G3 in the Online Appendix. We find strong evidence of the age of the partner being predictive of the likelihood of having a child (*p-value* < 0.001), but no evidence of the empowerment programs affecting the partner's age or other indicators of partner characteristics.

5 Conclusion.

The paper reports from a large-scale study of women empowerment in rural Tanzania. We implemented a factorial randomized controlled trial to study how opportunities and decision-making power shape the economic and fertility choices of young women when they transition into adulthood. The analysis builds on an unusually rich data set collected in three rounds over more than four years, containing survey data, lab-in-the-field experimental data, and medical data. The intervention used local resources, which strengthens its external validity and demonstrates scalability (Al-Ubaydli et al., 2017).

We find that the economic empowerment of young women leads to a large and enduring increase in their income. This is in contrast to much of the previous literature on economic empowerment that typically finds muted effects from such interventions (Blattman and Ralston, 2015; Card et al., 2018; McKenzie, 2017; McKenzie and Woodruff, 2014). We argue that this may be because the economic empowerment program in the present study targeted younger, unmarried women not yet restricted by family obligations. Hence, the analysis highlights the importance of providing young women with economic opportunities at an early age before they make important life choices, and we show that such interventions may cause a long-term reduction in poverty.

The present study further shows that economic opportunities have spillover effects to the reproductive health domain. The economic empowerment program causes an increase in teenage pregnancy and the proportion of women who started childbearing. Our evidence suggests that the underlying mechanism is a positive income effect on fertility, in line with recent stylized facts from richer countries (Black et al., 2013; Brehm and Brehm, 2022; Kearney and Wilson, 2018; Lindo, 2010), global trends in fertility (Doepke et al., 2022), and historical patterns (Ashraf and Galor, 2011; Lagerlöf, 2015). We show that the positive income effect on fertility is specific to the women who have a flexible occupation, which may contribute to explain why our results differ from some other recent studies of how labor market opportunities shape fertility (Heath and Mobarak, 2015; Jensen, 2012). Jensen (2012) finds that an increase in the likelihood of getting a job in the business outsourcing industry in India reduced the likelihood of young women in rural areas getting married and having a child, and Heath and Mobarak (2015) find that an

explosive growth in the Bangladeshi ready-made garments industry had a negative effect on fertility for women exposed to the garment sector. These findings are not necessarily in conflict with the finding of a positive income effect on fertility in the present study, since they consider increases in labor market opportunities that are hard to reconcile with taking care of children.

The reproductive health empowerment program also caused an increase in fertility, and we provide evidence suggesting that the fertility effect is driven by the women entering a relationship at an earlier age. This mechanism is in line with the fertility model proposed by Duflo et al. (2015), which builds on the idea that the cost of pregnancy is lower in a relationship. However, we also find evidence of social norms playing a role in shaping both the income mechanism and the relationship mechanism, the women perceive an increase in social pressure to have a child when they have an income or a partner. In line with the social norm mechanism, we find that both the income effect and the relationship effect are smaller for women with greater decision-making power. Taken together, we interpret the evidence to be in line with the literature arguing that fertility is largely driven by social norms (Beach and Hanlon, 2022; La Ferrara et al., 2012; Spolaore and Wacziarg, 2022).

Social pressure to have children should likely affect the well-being of the women, and we provide a detailed analysis of how the empowerment programs affected self-reported happiness in Online Appendix H. We show that they cause a significant short-term increase in happiness, but this effect faded in the long term for the women who only received the economic empowerment program. This may reflect hedonic adaptation (Galiani et al., 2018) or that the economic empowerment program gave them aspirations that were not fulfilled in the long term, possibly because of social pressure (Bernard et al., 2019; Dalton et al., 2016; Genicot and Ray, 2017, 2020; La Ferrara, 2019). The reproductive health empowerment program had a lasting positive effect on happiness, which suggests that decision-making power in the fertility domain and being in a relationship are important contributors to happiness. We complement this analysis by also studying how the empowerment programs affected objective and self-reported health measures. We find a significant decrease in syphilis among women receiving the reproductive health empowerment program, but no significant treatment effects on malaria or the self-reported health measures in any of the treatment arms.

Women empowerment requires that women have both opportunities and decision-making power, and this study has shown how economic and reproductive health empowerment programs may have lasting effects on the lives of young vulnerable women constrained by social norms. We find that economic empowerment can contribute to reduced poverty, but also that empowerment programs may initiate behaviors that increase the social pressure on women to have children. More research is needed to better understand how to ensure that women can overcome societal constraints when making economic and fertility choices.

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Online Appendix – On the Doorstep of Adulthood: Empowering Economic and Fertility Choices of Young Women

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A   Attrition.

We report in Table A1 the OLS estimates of the treatment effects on the probability of being included in the different surveys. We find that the attrition is not significantly correlated with the treatment assignments.

Table A1: Attrition by treatment arm in each survey.

	(1) Short term	(2) Medium term	(3) Long term	(4)
			Phone	Face to face
Economic	-0.012	-0.025	-0.004	-0.022
	(0.038)	(0.031)	(0.022)	(0.036)
SRH	-0.051	0.002	0.012	-0.000
	(0.033)	(0.027)	(0.016)	(0.028)
Econ. & SRH	-0.027	-0.013	-0.000	-0.012
	(0.037)	(0.025)	(0.017)	(0.029)
Mean control	0.85	0.87	0.93	0.84
Observations	3483	3483	3483	3483

The table provides OLS estimates of the treatment impacts ("Economic", "SRH" and "Econ. & SRH") on the probability of being surveyed at different points in time. The standard errors, in parentheses, are clustered at the level of randomization, the schools. None of the coefficients are statistically significantly different from zero at the 0.05 level of significance.

B What are the effects of women empowerment programs reported in other studies?

This section provides an overview of existing interventions studying how different types of women empowerment programs affect fertility. Table B2 provides a list of the studies covered in the overview. The list is established from a general free search of the literature. We have included all randomized controlled trials that study women empowerment, target young women, and report fertility outcomes, even if the intervention did not have fertility as the main focus. Fertility is in most studies self-reported based on a question about whether the respondent has ever been pregnant (in some cases, formulated as "ever given birth", or "have children"). In Figure B1, we summarize the literature review by showing the estimated effects and confidence intervals ordered by how many years after the baseline fertility was measured.

In Table B2, we provide a crude classification of whether the interventions are on sexual and reproductive health (SRH) or economic (ECON) women empowerment, report key features of the studies, and the estimated effect on fertility for each follow up round and each treatment arm (compared to the control group). We also highlight whether
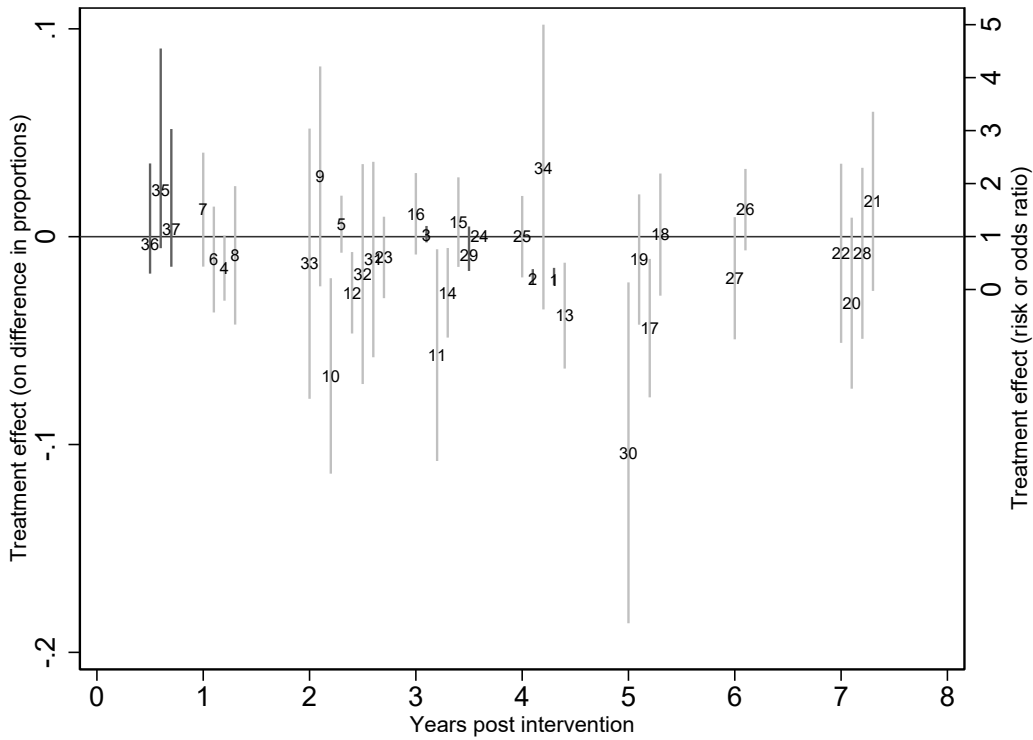
Note: The Figure shows the estimated effects of various women empowerment programs on fertility (ever having been pregnant). The plotted numbers correspond to the point estimates, with the number referring to the ID number of the study in Table B2. The horizontal axis indicates when the effect is measured (in years after the intervention). The estimates from studies 1, 2, 3, 29, 35, 36 and 37 (dark gray intervals) are expressed in risk ratios or odds ratios (ratio of proportions in treated and control arms) and must be read on the right axis. The other estimates (light gray intervals) are expressed as the difference between the proportions in the treated and control arm and must be read on the left axis. The bars correspond to 95 percent confidence intervals.

Figure B1: Estimates of women empowerment effects on fertility.

the study measured the effect of the intervention on income, since a main finding in the present paper is the positive income effect from an economic women empowerment program on fertility. We enter one line per study, per arm and per round of follow-up. **ID** is the line number used as a reference in Figure B1. For example, lines (7)–(10) report the estimated effects from Baird et al. (2011): two cash transfer programs (conditional and unconditional) at two points in time (one year and two years after the intervention) (a–d). For each estimate, we report **Reference** (the full reference can be found in the reference list), **Type of intervention** (sexual and reproductive health (SRH) or economic (ECON) women empowerment), **Country (years)** (indicate where and when the study was conducted), **Time** (the number of years between the baseline and the follow-up), **Age** (the age of the participants at baseline), **N** (the number of observations), **Proportion ever pregnant** (the proportion of pregnant participants in the control and the treated group), **Treatment effect** (the estimated treatment effect on the difference in proportions

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as reported in the paper), **Risk/odds ratio** (the relative risk coefficient or the odds ratio), **95 % CI** (the corresponding confidence interval, calculated based on reported standard errors if not reported in the paper), and **Income effect** (indicates whether the effects on income-related measures are reported and the nature of the effects).

Table B2: The effect of women empowerment on fertility in other studies.

ID	Reference	Type of intervention	Country (years)	Time	Age	N	Proportion ever pregnant		Treatment effect	Risk/odds ratio	95% C.I.	Income effect
							Control	Treated				
1	1)Cabezon et al (2005)	SRH(1997cohort) Abstinence educ.	Chile (1996-2001)	4	15-16	1259	0.189	0.033	-0.156	0.17619	[0.076 ; 0.409]	Not reported
2	2)Cabezon et al ((2005)	SRH(1998cohort) Abstinence educ.	Chile (1996-2001)	4	15-16	1259	0.226	0.044	-0.182	0.19574	[0.100 ; 0.385]	Not reported
3	Ross et al (2007)	SRH Multiple info. intervent.	Tanzania (1998-2001)	3	15.7	4775	0.455	0.469	0.014	1.03	[0.890 ; 1.200]	Not reported
4	Dupas (2011)	SRH Info HIV-risk	Kenya (2003-2005)	1	15.1	5988	0.054	0.03888	-0.01512		[-0.031 ; 0.001]	Not reported
5	Dupas (2011)	SRH Abstinence educ.	Kenya (2003-2005)	2	15.1	5988	0.054	0.06	0.006		[-0.008 ; 0.020]	Not reported
6	Baird et al (2010)	ECON CCT	Malawi (2007-2008)	1	15.61	2691	0.166	0.155	-0.011		[-0.036 ; 0.014]	Not reported
7	1)Baird et al (2011)	ECON CCT	Malawi (2008-2010)	1	15.2	2086	0.089	0.102	0.013		[-0.014 ; 0.040]	Not reported
8	2)Baird et al (2011)	ECON UCT	Malawi (2008-2010)	1	15.2	2086	0.089	0.08	-0.009		[-0.042 ; 0.024]	Not reported
9	3)Baird et al (2011)	ECON CCT	Malawi (2008-2010)	2	15.2	2087	0.247	0.276	0.029		[-0.024 ; 0.082]	Not reported
10	4)Baird et al (2011)	ECON UCT	Malawi (2008-2010)	2	15.2	2087	0.247	0.18	-0.067		[-0.114 ; -0.020]	Not reported
11	Jensen (2012)	ECON Recr. serv-¿jobs	India (2003-2006)	3	15–21	1442	0.43	0.373	-0.057		[-0.108 ; -0.006]	Impact on employment, not on expenditures
12	1)Bandiera et al (2020)	ECON +SRH Voc.tr&info	Uganda (2008-2012)	2	16.3	4806	0.123	0.091	-0.027		[-0.047 ; -0.007]	Large impacts on self-empl and expenditures
13	2)Bandiera et al (2020)	ECON +SRH Voc.tr&info	Uganda (2008-2012)	4	16.3	3415	0.114	0.144	-0.038		[-0.063 ; -0.013]	Impact on self-employment
14	1)Duflo et al (2015)	ECON Educ sub	Kenya (2003-2010)	3	13.7	9433	0.16	0.133	-0.027		[-0.049 ; -0.005]	Not reported
15	2)Duflo et al (2015)	SRH HIV educ	Kenya (2003-2010)	3	13.7	9433	0.16	0.167	0.007		[-0.015 ; 0.029]	Not reported
16	3)Duflo et al (2015)	ECON +SRH Subs + HIV educ	Kenya (2003-2010)	3	13.7	9433	0.16	0.171	0.011		[-0.009 ; 0.031]	Not reported
17	4)Duflo et al (2015)	ECON Educ sub	Kenya (2003-2010)	5	13.7	8302	0.329	0.285	-0.044		[-0.077 ; -0.011]	Not reported
18	5)Duflo et al (2015)	SRH HIV educ	Kenya (2003-2010)	5	13.7	8302	0.329	0.33	0.001		[-0.028 ; 0.030]	Not reported
19	6)Duflo et al (2015)	ECON +SRH Subs + HIV educ	Kenya (2003-2010)	5	13.7	8302	0.329	0.318	-0.011		[-0.042 ; 0.020]	Not reported
20	7)Duflo et al (2015)	ECON Educ sub	Kenya (2003-2010)	7	13.7	5719	0.493	0.461	-0.032		[-0.073 ; 0.009]	Not reported
21	8)Duflo et al (2015)	SRH	Kenya	7	13.7	5719	0.493	0.51	0.017		[-0.026 ; 0.060]	Not reported

No	Study	Type / Intervention	Country / Period	Dur	Age	N	Baseline	Follow-up	Effect	OR	CI	Reported
		HIV educ	(2003-2010)									
22	9)Duflo et al (2015)	ECON +SRH Subs + HIV educ	Kenya (2003-2010)	7	13.7	5719	0.493	0.485	-0.008		[-0.051 ; 0.035]	Not reported
23	1)Palermo et al (2016)	ECON UCT	Zambia (2010-2014)	2	28.2	2096	0.99	0.98	-0.01		[-0.030 ; 0.010]	Not reported
24	2)Palermo et al (2016)	ECON UCT	Zambia (2010-2014)	3	28.2	2171	1	1	0		[0.000 ; 0.000]	Not reported
25	3)Palermo et al (2016)	ECON UCT	Zambia (2010-2014)	4	28.2	2178	0.98	0.98	0		[-0.020 ; 0.020]	Not reported
26	1)Buchman et al (2018)	SRH Safe space&educ	Bangladesh (2007-2017)	6	15-17	15405	0.61423	0.62723	0.013		[-0.007 ; 0.033]	Not reported
27	2)Buchman et al (2018)	ECON Delay mar.inc.	Bangladesh (2007-2017)	6	15-17	15405	0.61423	0.59423	-0.02		[-0.049 ; 0.009]	Not reported
28	3)Buchman et al (2018)	ECON +SRH Inc + Safe space&ed	Bangladesh (2007-2017)	7	15-18	15406	0.61423	0.60623	-0.008		[-0.049 ; 0.033]	Not reported
29	Cho et al (2017)	ECON Free sch.unif.+fees	Kenya (2011-2014)	3	14.8	343	0.168605	0.116959	-0.05165	0.65	[0.350 ; 1.190]	Not reported
30	Hallfors et al (2015)	ECON Free unif.+fees+suplies	Zimbabwe (2007-2012)	5	12	287	0.222	0.118	-0.104		[-0.186 ; -0.022]	Not reported
31	1)Özler et al (2019)	SRH Life skills +cash	Liberia (2016-2018)	2	13-14	1174	0.167	0.156	-0.011		[-0.058 ; 0.036]	Not reported
32	2)Özler et al (2019)	ECON +SRH Life s.curr + more cash	Liberia (2016-2018)	2	13-14	1174	0.167	0.149	-0.018		[-0.071 ; 0.035]	Not reported
33	1)Austrian et al (2020)	SRH Group meetings ++	Zambia (2013-2017)	2	14.4	3080	0.34	0.327	-0.013		[-0.078 ; 0.052]	Not reported
34	2)Austrian et al (2020)	SRH Group meetings ++	Zambia (2013-2017)	4	14.4	3080	0.44	0.473	0.033		[-0.035 ; 0.102]	Not reported
35	1) Burke et al (2020)	ECON Econ.training	South Africa (2015-2016)	0.5	15.4	1656	0.04	0.071	0.63	1.88	[0.780 ; 4.550]	Not reported
36	2) Burke et al (2020)	SRH HIV/SRH train	South Africa (2015-2016)	0.5	15.4	1656	0.04	0.03	-0.17	0.85	[0.300 ; 2.380]	Not reported
37	3) Burke et al (2020)	ECON +SRH Econ+HIV train	South Africa (2015-2016)	0.5	15.4	1656	0.04	0.041	0.13	1.14	[0.430 ; 3.030]	Not reported

C   Variables.

In this section, we report the list of variables used in all the Figures and Tables, their definition, when they were measured, in which Tables and Figures they appear, and whether they were included in the pre-analysis plans. The variables are listed in Table C1 by their order of appearance in the paper.

Table C1: The variables used in the analysis.

	Variable	Definition	Measured at	Used in	Included in the pre-analysis plans?
1	Ideal age at first birth.	The answer, in years, to "At what age would you like to have your first child?".	Baseline and short term.	Figure 1a, Table 5.	No.
2	Ranking of future occupations.	The answer to What would you like to do in the near future if you are not selected for A-levels after you have completed Form IV? Rank the following alternatives from 1 to 6, where 1 is the one you like the most and 6 is the one you like the least: Take a vocational training course; Start a business; Work in farming; Employment in private sector; Work as a domestic; Start a family and stay at home.	Baseline.	Figure 1a.	No.
3	Age.	Age in years.	Baseline.	Table 1.	No.
4	Age > 17.	A binary variable equal to one if the respondent is 18 years old or older.	Baseline.	Table 1.	Yes, as covariate and for heterogeneous impact analysis.
5	Cognitive ability.	A binary variable equal to one for values of the cognitive ability index above the median. The cognitive ability index is made of three questions.	Baseline	Table 1.	Yes, as covariate and for heterogeneous impact analysis.
6	Risk aversion.	A binary indicator equal to one if the answer to question 2.2.3. in the baseline questionnaire is "I would keep 100 000" or "I would keep 75 000".	Baseline	Table 1	Yes, as covariate.
7	Health knowledge.	The proportion of correct answers given to four health knowledge questions.	Baseline	Table 1	Yes, as covariate.
		The proportion of correct answers given to seven health knowledge questions. The questions were incentivized with TSZ 100 per correct answer.	Short term	Table 4	Yes, as outcome.
8	Business knowledge.	The proportion of correct answers given to three questions about business practice.	Baseline	Table 1	Yes, as covariate.

		The proportion of correct answers given to five questions about business practice. The questions were incentivized with TSZ 100 per correct answer.	Short term	Tables 4 and F1.	Yes, as outcome.
9	Wealthy household.	An index of family wealth based on (i) whether the household owns a TV, (ii) how many days per week do they eat meat at home, (iii) whether the household is connected to electricity. The index is constructed by taking the average of the standardized variables on these three dimensions, where we then use a dummy for whether this index takes a value above or below the median.	Baseline	Table 1.	Yes, as covariate and for heterogeneous impact analysis.
10	Household owns a business.	A binary variable equal to one if the household head owns a business.	Baseline	Table 1	Yes, as covariate.
11	Woman-headed household.	A binary variable equal to one if the household head is a woman.	Baseline	Table 1	Yes, as covariate.
12	Remote school.	A binary variable equal to one if it takes at least 30 minutes by car to reach the school from the local district headquarters.	Baseline	Tables 1.	Yes, as covariate and for heterogeneous impact analysis.
13	N women.	The number of female students in Form IV.	Baseline	Table 1	Yes, as covariate.
14	Self-employment.	An indicator equal to one if she owns a business, including farming, poultry and livestock rearing.	Baseline, short term, medium term and long term	Tables 2 and F1 and Figure 3.	Yes, as outcome.
15	Teenage childbearing.	An indicator equal to one if she had her first child before she was 20 years old.	Baseline, medium term and long term	Tables 3, 7, and Figure 3.	No.
16	Business income (ihst)	Inverse hyperbolic sine transformation of the revenues from the business in a normal week	Short term, medium term and long term	Tables 2 and F1.	Yes, as outcome.
17	Total income (ihst).	Inverse hyperbolic sine transformation of the sum of the business income and all other incomes.	medium term and long term	Table 2 and F1.	Yes, as outcome in the medium term.
18	Age at first birth.	Mother's age when she gave birth to her first child.	medium term and long term.	Figure 4.	No.
19	Started childbearing.	Indicator equal to one if she is pregnant or has a child.	medium term and long term.	Tables 3 and 7.	Yes, as outcome.

20	Risk.	The answer to "I am willing to take risks, in general. Tick one from 0 to 10, where 0 is "completely unwilling" and 10 is "completely willing"", standardized by subtracting the mean of the control group and dividing by the standard deviation of the control group.	Short term.	Table 4.	No.
21	Patience.	Indicator variable equal to one if the respondent hypothetically chooses to wait for 1 month to receive TZS 20,000 instead of receiving TZS 10,000 today.	Short term.	Table 4.	No.
22	Competitiveness.	A binary indicator equal to one if she chose the competitive payment scheme over the fixed rate scheme in an incentivized lab-in-the-field experiment set up to measure the willingness to compete.	Short term	Table 4.	Yes, as outcome.
23	Self-control.	This index is constructed as the mean answer value to the seven following statements: (i) I have little control about things that happen to me, (ii) I often feel helpless dealing with the problems of life, (iii) There is not much I can do to change important things in my life, (iv) On the whole, I am satisfied with myself, (v) I am quite sure of myself, (vi) I certainly feel useless at times, (vii) I have a positive attitude towards myself. The answers were given on a five-point scale: 1 Strongly disagree, 2 Disagree, 3 Neither agree nor disagree, 4 Agree and 5 Strongly agree. Responses were rescaled were appropriate so that a higher value of the index indicates more self-control.	Short term	Table 4.	Yes, as outcome.
24	Gender equality – economic.	The answer to: "it is accepTable to me that a wife earns more money than her husband". The response is on a scale of 1 to 5, where 1 is Strongly disagrees and 5 is Strongly agrees.	Short term	Tables 4 and F1.	Yes, as outcome.
25	Gender equality – health.	We ask the following question that comes from the DHS - Tanzania: "do you agree that a husband is justified in hitting or beating his wife if (answer YES or NO): 1. she burns the food 2. she argues with him 3. she goes out without telling him 4. she neglects the children 5. she refuses to have sexual intercourse with him The variable is equal to the number of No answers given by the respondent.	Short term	Table 4.	Yes, as outcome.

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26	Decision-making power index.	The variable is constructed as follows: we make an index with the three decision-making variables (self-control, gender equality in the health and in the economic domains) using principal component analysis. Then, we make a binary variable equal to one if that index is above its median value.	Short term	Tables and 7.	4	No.
27	Keep studying.	A binary variable equal to one if she answers yes to "Have you made plans to continue to study recently (in the last few months)".	Short term.	Table 5.		No.
28	Set up a business.	A binary variable equal to one if she answers yes to "Have you made plans to start a business recently (in the last few months) ?".	Short term.	Tables and F1.	5	Yes.
29	Age at marriage.	The answer in years to "At what age do you want to get married?".	Short term.	Table 5.		No.
30	Age at first birth.	The answer in years to "At what age would you like to have your first child?".	Short term.	Table 5.		No.
31	Student.	An indicator equal to one if she answered yes to "Are you attending school or training now?".	Medium term.	Table 6.		No.
32	Self-employed: non agri.	An indicator equal to one if she owns a non agricultural business.	Medium term.	Table 6.		No.
33	Self-employed: land.	An indicator equal to one if she owns and cultivates a plot of land.	Medium term.	Table 6.		No.
34	Self-employed: livestock.	An indicator equal to one if she raises livestock.	Medium term.	Table 6.		No.
35	Salaried employment.	An indicator equal to one if she answered yes to "Do you work in someone else's home or business?", or "Do you work on somebody else's farm?", or "Do you have formal employment?".	Medium term	Table 6.		No.
36	Family business.	An indicator equal to one if she answered yes to "Do you help out in family business?" or "Do you help out on a family farm?".	Medium term	Table 6.		No.
37	Domestic chores.	An indicator equal to one if she answered yes to "Do you do domestic work at home?"	Medium term	Table 6.		No.
38	Relationship.	An indicator equal to one if she reported being married, engaged, living with a partner or having a boyfriend.	Medium term	Tables and 7.	6	No.
39	Money from boyfriend.	An indicator equal to one if she reported receiving money from a boyfriend.	Medium term	Table 6.		No.
40	Migrated.	An indicator equal to one if she reported living in a different place than at baseline.	Medium term	Table 6.		No.
41	Has income.	An indicator equal to one if she has any source of income.	Medium term	Table 7.		No.
42	Happiness (binary).	An indicator equal to one if she says she *agrees* or *strongly agrees* with the statement "I am very happy with my life".	Baseline, short term, medium term and long term	Table H4.		No.

43	Happiness (continuous).	Response value to the following question, where we ask whether they agree that "I am very happy with my life", using the scale "1. Strongly disagree, 2. Disagree, 3. Neither agree nor disagree, 4. Agree, 5. Strongly agree".	Baseline, short term, medium term and long term.	Table H4.	Yes, as outcome in the medium and long term.
43	Health index.	An indicator variable equal to one if the respondent reports in the face-to-face interview: (i) STDs, (ii) Abnormal genital discharges, or (iii) Genital sore or ulcer, or if the respondent is tested positive for syphilis.	Long term.	Table H4.	Yes, as outcome.
44	Syphilis.	An indicator variable equal to one if the respondent is tested positive for syphilis.	Long term.	Table H4.	Yes, as outcome.
45	Malaria.	An indicator variable equal to one if the respondent is tested positive for malaria.	Long term.	Table H4.	Yes, as outcome.
46	Short term.	An indicator variable equal to one if the respondent was interviewed in the short-term survey.	Short term.	Table A1.	No.
47	Medium term.	An indicator variable equal to one if the respondent was interviewed in the medium-term survey.	Medium term.	Table A1.	No.
48	Long term (phone).	An indicator variable equal to one if the respondent was interviewed in the long-term phone survey.	Long term.	Table A1.	No.
49	Long term (face-to-face).	An indicator variable equal to one if the respondent was interviewed in the long-term face-to-face survey.	Long term.	Table A1.	No.

The Table displays the list of variables used in all the Figures and Tables, their definition, when they were measured, in which Tables and Figures they appear, and whether they were included in the pre-analysis plans.

D Multiple hypothesis testing correction.

This section provides an overview of how we have adjusted the *p-values* for multiple hypothesis testing.

We group the outcomes into coherent families and then adjust the *p-values* within each family. We adjust separately for each of the following three main questions that test conceptually distinct hypotheses:

1. Compared with the control group, do the treatment have an impact on outcome Y_{ij} (β_1, β_2, or β_3 different from zero)?

2. Do the treatment have differential impact (β_1 different from β_2, β_1 different from

β_3, or β_2 different from β_3)?

3. Is the impact of the Combined treatment different from the sum of the impact of the Economic and SRH treatments ($\beta_1 + \beta_2$ different from β_3)?

We follow the procedure described in Benjamini and Hochberg (1995) to control for the false discovery rate. In the tables, we define the families and report the results of hypothesis tests using both unadjusted *p-values* (using the asterisk $*$ symbol) and *p-values* adjusted for multiple hypothesis testing (using the star $\star$ symbol).

E Heterogeneity analysis.

In this section, we provide a more detailed discussion of the heterogeneity analysis. We test whether the treatments had differential impacts along four prespecified dimensions — at the individual level (age and cognitive ability; these variables could in principle directly influence the students' understanding of the program and their fertility and economic choices), at the household level (wealth; richer households may have different opportunities to setup a business, e.g. better access to capital, or to delay marriage and pregnancy), and at the school level (geographical remoteness; more remote schools are likely to be in environments that are less conducive to income generating activities and women empowerment).

We estimate Equation (2) and report the estimates and standard errors of θ_4, θ_5 and θ_6 for the main outcomes (Self-employment, Business income, Total income, Teenage pregnancy, and Started childbearing) in Tables E1 and E2. We do not find any significant heterogeneous impacts that are robust to adjusting the *p-values* for multiple hypothesis testing.

We also show the treatment effects by sub-group in Figure E1. In both the economic and health domains, the treatment effects are consistent across subgroups and in line with the estimated average treatment effects. In the economic domain, we observe an increase in self-employment, business income, and total income in all subgroups in the Economic and Combined treatment arms, and these effects are more pronounced than

in the SRH treatment arm. In the reproductive health domain, we observe an increase in teenage pregnancy and having started childbearing in (almost) all subgroups in all treatment arms.
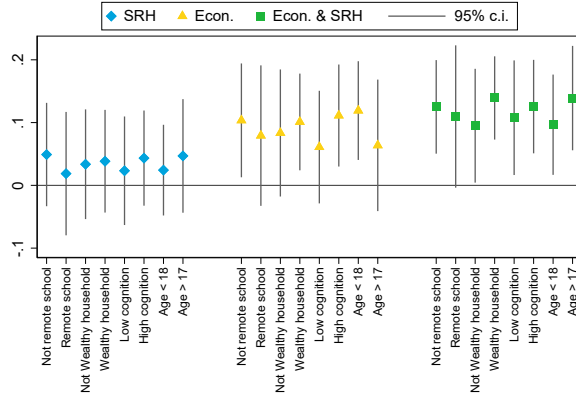
(a) Self-employment.
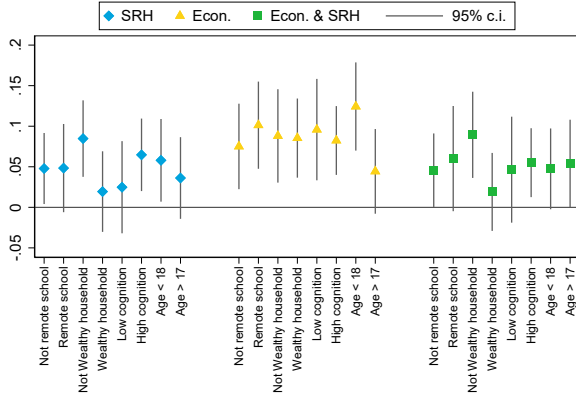
(b) Teenage pregnancy.
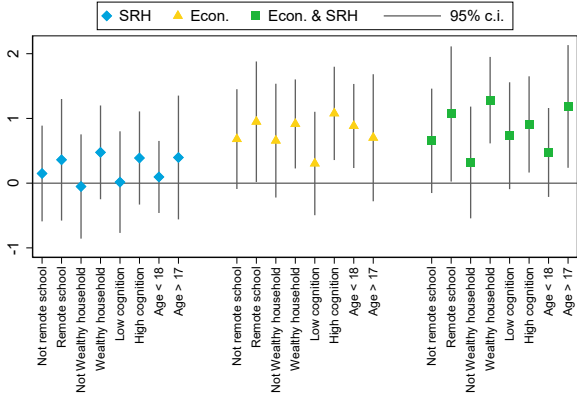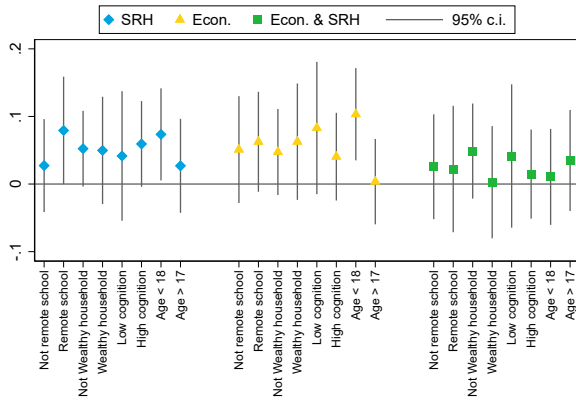
(c) Business income.

(d) Started childbearing.

(e) Total income.

Figure E1: Impact on the main outcomes in the long term by subgroups.

Note: The figure shows the estimated treatment impacts on (a) Self-employment, (b) Teenage pregnancy, (c) Business income, (d) Started childbearing and (e) Total income for the prespecified subgroups.

Table E1: Heterogeneous impacts on economic outcomes.

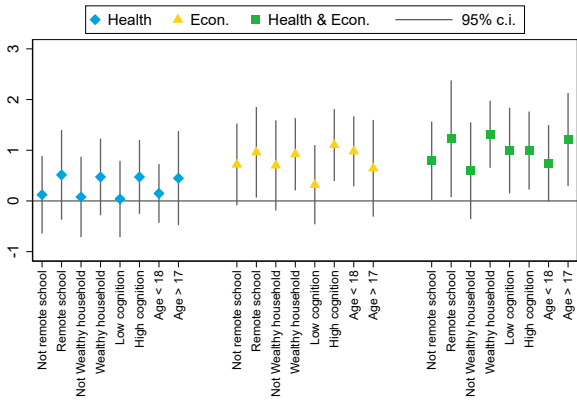|	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Self-employment			Business income (ihst)			Total income (ihst)
	short term	medium term	long term	short term	medium term	long term	medium term	long term
SRH								
Remote school	.035**	.036	-.03	.387**	.647*	.212	.086	.391
	(.016)	(.052)	(.064)	(.161)	(.377)	(.599)	(.563)	(.587)
Wealthy hh.	.009	-.016	.005	.049	-.591*	.527	-.582	.394
	(.022)	(.037)	(.056)	(.214)	(.334)	(.48)	(.491)	(.509)
High cognition	-.004	-.001	.02	-.018	.281	.372	-.108	.433
	(.017)	(.037)	(.05)	(.168)	(.309)	(.462)	(.471)	(.456)
Age > 17	.01	-.002	.023	.039	.149	.301	-.559	.302
	(.024)	(.045)	(.052)	(.225)	(.342)	(.504)	(.459)	(.498)
Economic								
Remote school	-.009	.058	-.024	-.037	.878*	.268	.419	.24
	(.024)	(.063)	(.072)	(.202)	(.474)	(.604)	(.595)	(.607)
Wealthy hh.	.017	.02	.018	.12	-.403	.258	.138	.22
	(.025)	(.045)	(.054)	(.244)	(.401)	(.487)	(.504)	(.518)
High cognition	.02	.015	.05	.194	.21	.774*	.088	.784*
	(.021)	(.043)	(.048)	(.193)	(.35)	(.459)	(.439)	(.438)
Age > 17	-.016	-.005	-.055	-.207	.261	-.182	-.453	-.335
	(.024)	(.04)	(.058)	(.22)	(.38)	(.555)	(.472)	(.558)
Econ. & SRH								
Remote school	.015	-.013	-.015	.178	.227	.415	-.651	.436
	(.033)	(.08)	(.068)	(.299)	(.64)	(.666)	(.721)	(.7)
Wealthy hh.	.043	.03	.044	.385	.267	.963**	.547	.72
	(.032)	(.056)	(.045)	(.292)	(.558)	(.404)	(.606)	(.461)
High cognition	-.012	.073	.018	-.059	.734*	.174	.284	0
	(.028)	(.045)	(.051)	(.262)	(.42)	(.451)	(.553)	(.471)
Age > 17	.013	-.023	.042	.128	.135	.711	-.158	.469
	(.027)	(.042)	(.051)	(.241)	(.357)	(.519)	(.41)	(.512)
Mean Control	.038	.187	.294	.344	1.162	2.359	2.547	2.542
Obs.	2895	2994	3249	2895	2994	3249	2992	3252

Note: The table provides OLS estimates of the interaction between the treatment assignment and the baseline variable of interest. The standard errors, in parentheses, are clustered at the school level (the unit of randomization). Statistically significant differences between the estimates and zero are indicated by $* p < 0.1$, $** p < 0.05$, $*** p < 0.01$ when the p-values are not corrected and by $\star p < 0.1$, $\star\star p < 0.05$, $\star\star\star p < 0.01$ when the p-values are corrected for multiple hypothesis testing. The correction considers the outcomes in this table to be part of the same family. All the estimations include the covariates listed in Table 1. "ihst" indicates that we use the inverse hyperbolic sine transformation of the variable.

F Correlations between treatment impacts on the short- and long-term economic outcomes.

We here provide further evidence on the underlying mechanism explaining the effect of the economic treatment effect on medium- and long-term economic outcomes. We argue that this effect reflects that (i) the treatment changed the participants' business knowledge, willingness to take risks and views of gender equality in the economic sphere in the short run, (ii) this led the participants to become more willing to start their own business, (iii) the plans to open a business materialize and the participants were more likely to have a business, and (iv) this led the participants to have higher business and total incomes, in the medium and long term (iv).

We provide evidence of (i) in Table 4 and (iv) in Table 2. In Table F1, we provide evidence of (ii) in Panel A and (iii) in Panel B. Panel A shows that there is a very strong and significant correlation between the plans to open a business and business knowledge, willingness to take risks, and views of gender equality in the economic sphere; Panel B shows that having business plans in the short term strongly correlates with having a business, business income and total income, in both the medium and long term.

Table E2: Heterogeneous impacts on fertility.

	(1) Teenage pregnancy	(2) Started childbearing	(3)
	long term	medium term	long term
SRH			
Remote school	.001	-.007	.052
	(.035)	(.034)	(.052)
Wealthy hh.	-.065*	-.033	-.003
	(.034)	(.03)	(.045)
High cognition	.04	.008	.018
	(.037)	(.026)	(.058)
Age > 17	-.022	-.033	-.047
	(.037)	(.021)	(.043)
Economic			
Remote school	.026	.002	.012
	(.037)	(.031)	(.054)
Wealthy hh.	-.003	-.006	.015
	(.037)	(.027)	(.053)
High cognition	-.013	.017	-.042
	(.034)	(.024)	(.057)
Age > 17	-.08**	-.031	-.1***
	(.038)	(.022)	(.035)
Econ. & SRH			
Remote school	.014	.021	-.003
	(.04)	(.038)	(.061)
Wealthy hh.	-.07**	-.025	-.046
	(.035)	(.034)	(.049)
High cognition	.009	.013	-.027
	(.037)	(.027)	(.06)
Age > 17	.007	.002	.024
	(.036)	(.027)	(.042)
Mean Control	.095	.056	.326
Obs.	3142	2993	3262

The table provides OLS estimates of the interaction between the treatment assignment and the baseline variable of interest. The standard errors, in parentheses, are clustered at the school level (the unit of randomization). Statistically significant differences between the estimates and zero are indicated by $*$ $p < 0.1$, $**$ $p < 0.05$, $***$ $p < 0.01$ when the p-values are not corrected and by $\star$ $p < 0.1$, $\star\star$ $p < 0.05$, $\star\star\star$ $p < 0.01$ when the p-values are corrected for multiple hypothesis testing. The correction considers the outcomes in this table to be part of the same family. All the estimations include the covariates listed in Table 1.

Table F1: Correlations between business knowledge, risk preferences, gender equality, plans to open a business, self-employment, and income.

	(1) Business plans	(2) Business plans	(3) Business plans	(4) Business plans	(5)	(6)
A. Correlations between business knowledge, risk, gender equality, and business plans.						
Business knowledge	0.151*** (0.043)			0.136*** (0.043)		
Willingness to take risks		0.012*** (0.003)		0.011*** (0.003)		
Gender equality (economic)			0.033*** (0.008)	0.028*** (0.008)		
Observations	2884	2894	2894	2884		

	Self-employment		Business income (ihst)		Total income (ihst)	
B. Correlations between business plans, self-employment, and income.						
	medium term	long term	medium term	long term	medium term	long term
Business plans	0.071*** (0.020)	0.101*** (0.024)	0.777*** (0.181)	1.038*** (0.269)	0.919*** (0.216)	1.113*** (0.268)
Observations	2539	2732	2539	2732	2538	2735

*Panel A provides OLS estimates of the correlations between the participant's plans to start their own business and business knowledge, willingness to take risks and gender equality in the economic domain. Panel B provides OLS estimates of the correlations between the participant's plans to start their own business and the likelihood of being self-employed, business income, and total income in the medium and long term. All the estimations control for the covariates listed in Table 1 and for the treatment assignment. The standard errors, in parentheses, are clustered at the school level (the unit of randomization). Statistically significant differences between the estimates and zero are indicated by * $p < 0.1$, ** $p < 0.05$. "ihst" indicates that we use the inverse hyperbolic sine transformation of the variable.*

G   Explaining the treatment effects on fertility

We here provide additional evidence of the mechanisms discussed in section 4.2: the flexibility of the labor market and the charcateristics of the partners.

An important focus in the literature has been on how labor market flexibility may play a role in explaining fertility patterns (Bandiera et al., 2022; Doepke et al., 2022). In our study, this should imply that the income effect on fertility is stronger for women who have income from self-employment than for women who have income from salaried work. To shed light on this hypothesis, we present in Table G2 a disaggregated version of the analysis in Table 7, where we consider the relationship between fertility and having income separately for self-employed women and women with salaried employment. We find strong evidence for the nature of the occupation being important for the relationship between income and fertility. For self-employed women, there is a strong positive association between having income and fertility, both for teenage pregnancy and having started childbearing. On average, women who are self-employed in the medium term are 9.5 percentage points more likely to have a teenage pregnancy (*p-value* < 0.001) and 8 percentage points more likely to have a child in the long term (*p-value* < 0.001). In contrast, we do not find any significant associations between income and fertility for women who have income from salaried work.

Table G2: Correlations between occupation in the medium term and fertility in the long term.

	(1) Teenage pregnancy	(2) Started childbearing
Has income from self-employment	0.095*** (0.017)	0.080*** (0.020)
Has income from salaried employment	0.000 (0.022)	0.041 (0.028)
Constant	0.149*** (0.031)	0.341*** (0.046)
Observations	2771	2873

The table provides OLS estimates of the correlation between (1) Teenage pregnancy and (2) Started childbearing in the long term and having an income from self-employment or from salaried employment in the medium term. All estimations include the covariates listed in Table 1 and indicator variables for treatment assignment. The sample used therefore comprises the participants that were interviewed in the baseline, medium term and long term, and for whom we have the measure of having started childbearing measure (2,871 observations) and teenage pregnancy measure (2,769 observations). We have fewer observations for Teenage pregnancy because less than for childbearing because we miss the timing of pregnancy. The standard errors, in parentheses, are clustered at the school level (unit of randomization). Statistically significant differences between the estimates and zero are indicated by $* p < 0.1$, $** p < 0.05$, $* * * p < 0.01$.

Partner's characteristics are likely to be of great importance for explaining fertility, and could potentially contribute to explain the income effect and the relationship effect if the empowerment programs caused women to have different partners than the control group. In the present study, we have data on the age of the partner in the long term, which is strongly correlated with having a child. On average, having a partner who is one year older is associated with a 3.9 percentage points increase in the likelihood of having a child (p-value< 0.001). We also find that there is large heterogeneity in the age of the partner, ranging from 18 years to 50 years.

However, we do not find any evidence of the empowerment programs having an impact on the age of the partner. In column (1) in Table G3, we show that the treatment effects on the age of the partner are small and not statistically significant, and Figure G1 shows that the distribution of the age of the partner is very similar and not statistically significantly different across the treatments and the control group.

Table G3: Treatment effects on partner characteristics and sexual behavior.

	(1) Partner's	(2)	(3) Woman decides:	(4)	(5)	(6)	(7) Sexual behavior	(8)	(9)
	age	sex	contraception	children	Age at first intercourse	Oldest sexual partner	# sexual partners	Transactional sex	Unwanted sex
Economic	.105	-.014	-.013	.011	-.058	-.032	-.115	.047	-.031**
	(.225)	(.013)	(.015)	(.012)	(.144)	(.211)	(.11)	(.032)	(.014)
SRH	.124	-.009	.016	.017*	-.165	.227	.155	.081**	-.003
	(.179)	(.011)	(.018)	(.009)	(.14)	(.18)	(.13)	(.033)	(.014)
Econ. & SRH	-.03	.005	-.011	.012	-.153	-.267	.016	0	-.016
	(.175)	(.013)	(.015)	(.01)	(.165)	(.179)	(.113)	(.031)	(.015)
Mean Control	25.384	.517	.541	.495	18.484	25.675	1.8	.156	.085
Obs.	2206	2895	2895	2895	2506	2506	2895	2895	2895

The table provides OLS estimates of the treatment impacts ("Economic", "SRH" and "Econ. & SRH"). The standard errors, in parentheses, are clustered at the school level (unit of randomization). Statistically significant differences between the estimates and zero are indicated by $*$ $p < 0.1$, $**$ $p < 0.05$, $***$ $p < 0.01$ when the p-values are not corrected and by $\star$ $p < 0.1$, $\star\star$ $p < 0.05$, $\star\star\star$ $p < 0.01$ when the p-values are corrected for multiple hypothesis testing. The correction considers all the outcomes in this table to be part of the same family. All the estimations include the covariates listed in Table 1. The dependent variables are all measured in the long term (2,895 observations). "Partner's age" is only defined for the sub-sample of participants who have a partner (2,206 observations). The dependent variables "Age at first intercourse" and "Oldest sexual partner" are measured for the sub-sample of participants who have had sexual relationships (2,506 observations). Definitions of dependent variables: Partner's age, Age at first intercourse, and Oldest sexual partner are all measured in years; Woman decides (husband or wife): who decides when to have sex (sex), whether to use condoms (contraception), whether to have children (children), are coded as 0 if they respond "the husband", 0.5 if they respond " both the husband and the wife", and 1 if they respond "the wife"; #sexual partners is the reported number of sexual partner; Transactional sex and Unwanted sex are indicator variables taking the value one if the report that they have had transactional or unwanted sex.

In columns (2)–(9) in Table G3, we study whether the treatments affect variables that likely are related to partner characteristics: how women perceive the decision-making process in a couple (columns 2–4) and self-reported sexual behavior (columns 5-9). We would expect partner characteristics to shape partner dynamics and the women's own experiences in decision-making in a couple, which likely would influence the women's view on who should decide (husband or wife) when to have sex, whether to use condom, and whether to have children. We would also expect the women's sexual history to influence
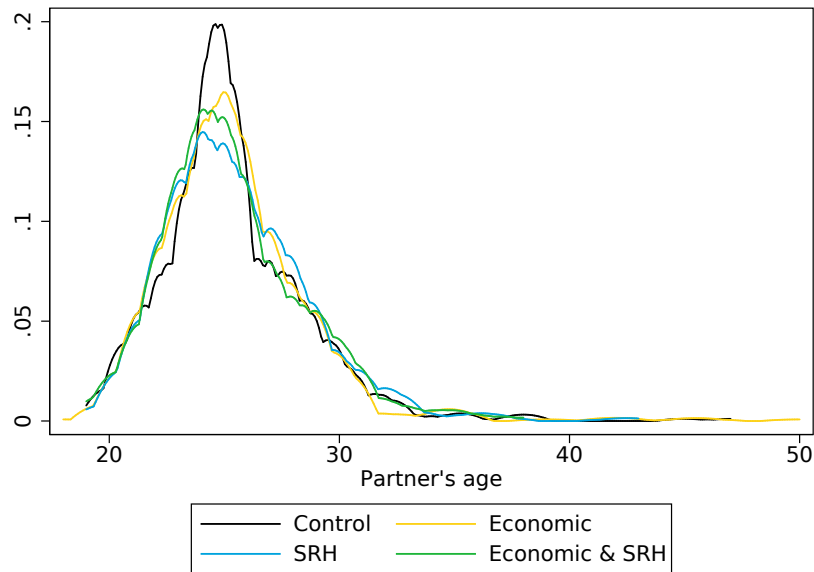
Note: *The figure shows the distributions of the partner's age, measured in the long-term, by treatment arm. We cannot reject the hypothesis that the distribution in the control group is equal to the ditributions in the treatment arms using the Kolmogorov-Smirnov test (SRH, p-value = 0.361); Economic, (p-value = 0.885); Econ. & SRH, (p-value = 0.546)*

Figure G1: Distribution of the partner's age, by treatment arm.

and reflect the characteristics of the partner they end up with.

We do not find evidence of the treatments affecting these variables that likely are related to partner characteristics. As shown in columns (2)–(4) in Table G3, the treatments do not have a statistically significant effect on how the women view the decision-making process in a couple. In terms of reported sexual behavior, columns (5)–(9), we find an effect of the SRH treatment causing the women to report more transactional sex (which includes receiving gifts for sex from their partner) and the Economics treatment causing women to report having less unwanted sex, but these effects are not robust to correcting for multiple hypothesis testing.

Taken together, the data —both the direct evidence and the indirect evidence— do not suggest that the treatments affected the partner selection.

H   Well-being.

In this section we discuss in more detail how the interventions affected the well-being of the women in terms of happiness and health. Happiness is a complex concept that may be shaped by the circumstances and expectations of others, and may partly reflect hedonic adaptation that attenuates the long-term impact on happiness of favorable changes (Galiani et al., 2018). Hence, it is interesting to examine how the happiness of the women developed over time and responded to the treatments.

In Figure H2, we show that the women in all the treatment arms are happier with their lives than those in the control group in the short term, which likely reflects that the treatments offered them new opportunities and decision-making power. There is a negative trend in happiness in the treatment arms over time, and the happiness among the women in the Economic treatment arm is indistinguishable from that in the control group both in both the medium and long term. However, in the SRH and Combined treatment arms, we observe consistently higher levels of happiness than in the control group.
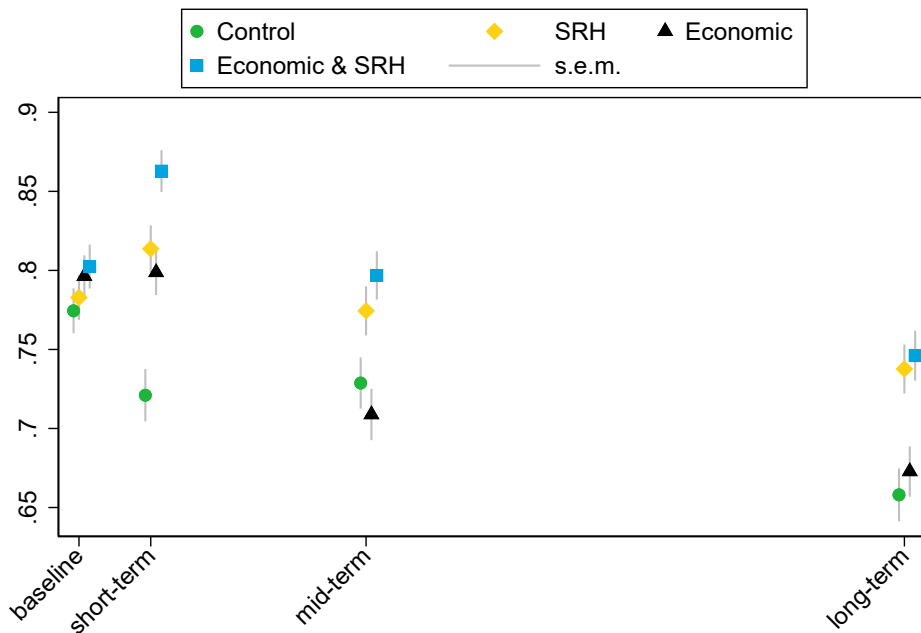
Note: The figure shows the proportion of respondents that agreed or strongly agreed with the statement "I am very happy with my life" by treatment arm and follow-up rounds.

Figure H2: Happiness.

In columns (1)–(6) in Table H4, we report the regression analysis on happiness, for both a standardized measure and a binary measure (the proportion of participants who are happy with their life). We observe that there is a negative trend in happiness in the control group, as they move from being students into early adulthood. Nonetheless, most women in the control group report to be happy with their life in the long term, even though the situation is quite different from what they envisioned at baseline. Most are unable to continue studying and many of them have a child much earlier than what they indicated as their preferred age for their first child. The self-reported happiness in the control group thus suggests that the women adapt to their situation over time.

We observe for both measures that the women in the Combined treatment arm are significantly happier than the women in the control group in all follow-up rounds. In the long term, there is an 8.8 percentage point increase in the proportion of women who are happy with their life in the Combined treatment arm over the control group. We also observe an increase in happiness in the SRH treatment arm, but the estimated treatment effect is not always significant.[1] In the Economic treatment arm, we do not observe any increase in happiness in the medium or long term. In the bottom panel, we observe that the effect on happiness is significantly higher in the Combined treatment arm than in the Economic treatment arm, but we do not find a significant difference in happiness between the Combined treatment arm and the SRH treatment arm in the medium or long term. Overall, the evidence suggests that the reproductive health empowerment program caused a sustained increase in the happiness of the women, whereas the economic empowerment program only had a short-term positive effect on happiness. This suggests that an increase in income does not necessarily lead to an increase in happiness. In line with previous research we also do not find any evidence of increased fertility causing an increase in happiness (Glass et al., 2016). The correlational evidence instead suggests that decision-making power and being in a relationship, which were key elements in the reproductive health empowerment program, are important contributors to happiness.

We now turn to a discussion of how the interventions affected the women's health. The increase in self-employment might have put the women in a more vulnerable position in terms of infections and social interactions, while the increase in the likelihood of being in

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[1]We should not rule out that there may be a decay effect in happiness due to hedonic adaptation that would make the effect on happiness disappear in the even longer run (Galiani et al., 2018).

a relationship might have affected the likelihood of being exposed to sexually transmitted diseases. In columns (7)–(9) in Table H4, we report treatment effects on different health measures in the long term, with a focus on sexual health, which was a key topic in the reproductive health empowerment program. Columns (7)–(8) show that the number of positive cases of syphilis and malaria was very low in the control group,: just 1.1 percent tested positive for syphilis and 1.3 percent for malaria. In the SRH arm, there was a significant decrease in the number of women with syphilis, but otherwise there were no significant treatment effects on syphilis or malaria. Column (9) shows that there is no treatment effect on an index that combines the test on syphilis with whether participants reported sexually transmitted diseases, experienced an abnormal discharge, or had a genital sore or ulcer in the last 12 months. The lack of strong effects on sexual health is in line with responses to questions on sexual behavior in the long term, where we also do not find strong treatment effects. We do not observe any impact of the interventions on the number of sexual partners, while there is a tendency that the reproductive health empowerment program has increased condom use and the economic empowerment program has reduced exposure to unwanted sex.

Table H4: Impacts on well-being.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			Happiness					Health	
	Short term		Medium term		Long term				
	Std.	Binary	Std.	Binary	Std.	Binary	Index	Syphilis	Malaria
Economic	.178$^{**}_{\star}$	.084$^{***}_{\star\star}$	-.018	-.019	-.026	.009	.001	-.003	-.024
	(.08)	(.031)	(.055)	(.027)	(.066)	(.036)	(.006)	(.004)	(.025)
SRH	.163$^{**}_{\star}$	.095$^{***}_{\star\star}$	.122	.043	.109*	.082$^{**}_{\star\star}$	.001	-.009**	.008
	(.08)	(.032)	(.088)	(.034)	(.064)	(.032)	(.006)	(.004)	(.025)
Econ. & SRH	.342$^{***}_{\star\star\star}$	.146$^{***}_{\star\star\star}$	.248$^{***}_{\star\star\star}$	.072$^{***}_{\star\star}$	.213$^{***}_{\star\star\star}$	.088$^{**}_{\star}$	-.006	-.003	-.021
	(.06)	(.024)	(.054)	(.026)	(.066)	(.04)	(.005)	(.005)	(.022)
Tests of equality of coefficients:									
Econ. - SRH	.015	-.011	-.14	-.062*	-.135*	-.073$^{**}_{\star}$	0	.006*	-.033
	(.085)	(.037)	(.093)	(.037)	(.071)	(.034)	(.007)	(.004)	(.029)
Econ. - Econ. & SRH	-.164$^{**}_{\star\star}$	-.062$^{**}_{\star}$	-.266$^{***}_{\star\star\star}$	-.091$^{***}_{\star\star}$	-.239$^{***}_{\star\star}$	-.079*	.007	.001	-.004
	(.064)	(.027)	(.059)	(.029)	(.071)	(.042)	(.005)	(.005)	(.027)
SRH - Econ. & SRH	-.179$^{***}_{\star\star}$	-.051*	-.126	-.029	-.104	-.006	.007	-.005	.029
	(.065)	(.029)	(.092)	(.036)	(.069)	(.039)	(.005)	(.005)	(.027)
SRH + Econ. - Econ. & SRH	-.001	.033	-.144	-.048	-.13	.003	.008	-.008	.005
	(.101)	(.041)	(.106)	(.044)	(.094)	(.053)	(.008)	(.006)	(.037)
Mean Control	.005	.721	-.012	.729	0	.658	.013	.011	.154
Obs.	2895	2895	2952	2952	3249	3249	2833	2824	2736

The table provides OLS estimates of the treatment effects on happiness and health ("SRH", "Economic" and "Econ. & SRH"). The standard errors, in parentheses, are clustered at the school level (unit of randomization). Statistically significant differences between the estimates and zero are indicated by $* \ p < 0.1$, $** \ p < 0.05$, $*** \ p < 0.01$ when the p-values are not corrected and by $\star \ p < 0.1$, $\star\star \ p < 0.05$, $\star\star\star \ p < 0.01$ when the p-values are corrected for multiple hypothesis testing. The outcomes in this table constitute two different families: Happiness and Health. All the estimations include the covariates listed in Table 1.

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