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The Impact of an Adult Literacy Program on the Next Generation: Evidence from India

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We use a randomized controlled trial to evaluate the impacts of an adult literacy program, targeting women in rural India, on a broad range of outcomes one year later. We show that the program had significant impacts on multiple aspects of the women's lives, such as improvements in the women's health and hygiene practices, as well as increased involvement in their children's education (but noted no differences in terms of health and educational outcomes of the children). In terms of mechanisms, we find that the program not only increased the women's literacy and numeracy, but also made the women more knowledgeable, and confident in dealing with people outside their family. We document positive effects on women's mobility, and some measures of bargaining power, but overall decision-making power appears not to have been affected.

JEL codes: I20; J16; O53

Keywords: adult literacy; gender, India, child health; child education

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1 Introduction

Education bestows a number of advantages on individuals in terms of improving their own material outcomes; parental education can also improve health and education outcomes of their offspring. However, nearly two-thirds of the world's 781 million illiterate adults are women, according to the UN's Worlds Women 2015 report (UN 2015). What happens when illiterate adults, particularly women, acquire functional literacy? Do the benefits of literacy extend to their families via greater investment in education and health behavior? Our paper investigates this central question by estimating the impact of a female adult literacy program, operational in north India, on investments in and outcomes of their children. Given that 37 percent of all illiterate adults are in India (UNESCO 2014), the evidence from India is critical in terms of our understanding of the broader, intergenerational impacts of adult female literacy.

While education can promote self-worth and personal development, literacy, and in particular, female literacy, also has an instrumental value. An extensive literature on the role of education outlines the possibilities (for an introduction and overview, see among others, Schultz 1988, Rosenzweig 1995, Rosenzweig and Kochar 2004, Alderman and Heady 2017). There are two tools to impart literacy skills: school education and adult education, i.e. adult literacy programs. The effects of formal, i.e., school education have been well studied (see, for instance, Schultz 1988, Thomas et al. 1991, Rosenzweig 1995, Foster and Rosenzweig 1996, Behrman et al. 1999, Handa 1996, Paxson and Schady 2007, Andrabi et al. 2012, Aslam and Kingdon 2012, Alderman and Heady 2017). We know less about the impacts of adult education. What happens when illiterate adults, particularly women, acquire functional literacy? And, if they benefit, do these benefits extend to their families, in particular the health and education of their children?

This distinction between school education and adult education is important. As Berhman et al. (1999) show, using panel data from a nationally representative survey of rural India collected in the mid 1970 to the early 1980s, it is important to note that the effects of female education on children's schooling outcomes can be highly non-linear in nature. In their study, children of mothers who are literate and have completed primary schooling study no more hours than the children whose mothers are literate but are not graduates of primary school. They attribute this effect to the productivity effort of female literacy on home teaching of children. Note that this study was set during the Green Revolution, and the value of education could be seen as one of an increased "ability to deal with disequilibria", specifically, to "in response to changing opportunities [...] to perceive, to interpret correctly and to undertake actions that will appropriately reallocate [...] resources" (cited from Schultz

1975, see also Foster and Rosenzweig 1996). Home teaching can be important in developing countries, where the quality of school education is often low (Glewwe and Kremer 2006). Effective home teaching can display itself in increased efficiency, or in a change in time allocation as mothers spend more time with their children doing homework (as in, Andrabi et al. 2012) and might result in improved performance in school (Paxson and Schady 2007, for instance, report an association between mothers' level of education and child test scores in Ecuador). Similarly, educated mothers might increase investments in the health of their children. Aslam and Kingdon (2012) show that educated mothers in Pakistan are more likely to immunize their children, and perhaps as a result, observe improved anthropometric child indicators (similar results are found by Handa 1996 in Jamaica).

While the results of a study such as Berhman et al. (1999) might be very different now, the main question remains. Is there a minimum amount of maternal education necessary before it can have a manifest impact on the health/educational outcomes of the next generation? And relatedly, does it matter as to when these skills are acquired, i.e. does imparting literacy during childhood have the same long-term effect as imparting literacy through adult education programs?

There is a small body of literature that focuses on the impact of adult education, and in particular, adult literacy programs. Blunch (2017) summarizes the evidence (see also Abadzi 2003 and 2013). He notes that even though most adult literacy programs show limited impacts on literacy, the literacy impacts are often higher with novel approaches. For instance, Aker et al. (2012) allocated mobile phones to a (randomized) subset of a traditional adult literacy program participants, and found substantial impacts on both writing and numeracy skills, possibly as they not only functioned as tools of learning but also increased the potential benefits from literacy/numeracy. Ghana's National Functional Literacy Program is another example of a relatively successful approach, lasting longer, 21 months, and classes meeting more frequently than most literacy programs, and resulting in substantial increases in reading outcomes, in particular (see Aoki 2005) - although it should be noted that some of the effects reported might be attributed to program selection effects. Overall, the body of rigorous evidence is small and needs to be strengthened, especially through studies from a variety of sociocultural contexts.

In addition, the evidence concentrates on the stated ex-ante aims of adult literacy programs, viz., of increased literacy (and often numeracy), but far less evidence on the other important, perhaps unintended effects of adult literacy programs. We contribute to this literature by estimating the impact of an adult literacy program for women in India on family educational and health investments and outcomes. The only other empirically rigorous study for India is Banerji et al. (2017), which shows only modest impacts on children's test

scores, even when the intervention is combined (cross randomized) with explicit guidance for home teaching. Blunch also reports effects on labor market participation, child mortality and household expenditure of the Ghanian National Functional Literacy Program (in Blunch 2009, 2013 and Blunch and Portner 2011). Sandiford et al. (1995) report that adult literacy participants in Nicaragua are more likely to send their children to school and keep them there, have fewer children and, also, a reduced child mortality rate.

In this study we ask how a discrete change starting at zero - going from no formal education to (more or less) functional literacy through an adult education program impacts the participants and their families. We worked together with an NGO, Development Alternatives. They have developed an innovative adult literacy program, called Tara Akshar+ (TA+), in which computer-aided instructors teach in an interactive manner to groups of ten women for a period of three months. The program builds on insights from cognitive psychology and uses memory tricks to teach the alphabet. Importantly, and quite common in these programs, it also includes teachings on numeracy.

We visited ten villages in India in the north Indian state of Uttar Pradesh, and invited all adult illiterate women to participate in this program. Through a public lottery, we randomly divided this group into a treatment group and a control group. The treatment group participated in the TA+ program that year, while the control group women were enrolled after a one year lag. We collected baseline data prior to the randomization and endline data seven months after the treatment group participated in the program and, before the control group was enrolled. We also conducted a midline survey immediately after the program was completed by the treatment group. Our analysis sample consists of 391 women.

Comparing the women at endline, we find that participation in the program had positive effects that went beyond the immediate effects of acquiring greater literacy and numeracy skills. Women who participated in the program made significantly more investments in the education and health of their family. Specifically, we find that women practiced improved hygiene (washed hands more often, covered water vessels), were more likely to visit health clinics, and were more involved in the education of their children, in particular by assisting the children with their homework and reminding them to complete it. We however do not document any significant impacts on school enrolment, attendance or child test scores. Nor do we document any significant impacts on child morbidity, in terms of days a child was reported ill last month.

In addition to collecting data on educational and health investments and outcomes, we also collected data which allow us to say something more about the mechanisms of these effects, or lack thereof. As Blunch (2013) notes, it is often unclear as to which part of the programs work and which ones do not. For instance, in the Ghana National Functional

Literacy Program, we do not see any drastic impacts on the literacy and numeracy skill set of the participants, but do observe significant impacts on the women's lives. This suggests that the latter impacts might be due to network effects, or an increase in income-generating activities, perhaps as a result of increased bargaining power or other skills. Understanding why a program works, or relatedly, why certain components work and others do not work, is of utmost importance from a policy perspective, as one might need to complement the adult literacy program with other investments to achieve the desired results.

First, we extensively tested the women's literacy and numeracy skills. Second, we collected detailed data on the women's knowledge of their community, and health and educational matters, as well as self-reported confidence, and their position in the household. An innovative feature of our data collection include a bargaining game in which we asked a woman and her spouse to negotiate over the value of water tablets. By comparing the woman's valuation of the water tablet, with her husband's, and their joint valuation, we are able to determine her exact bargaining position.

These data not only allow us to shed light on the mechanisms through which the observed impacts might have taken place, but also to speculate on what the longer term effects could be. In Deshpande et al. (2017), we document the positive effects of the program in terms of literacy and numeracy. This increased skill set, together increased exposure to discussion on a wide variety of topics, might result in increased knowledge of health and educational matters (which we know, matters, see for instance, Glewwe 1999). Consistent with this, we show large, significant impacts on knowledge. The program might also have changed the woman's position in the household, a channel documented within the context of school education (see Aslam and Kingdom 2012). In particular, we document changes in women's mobility; specifically, whether she needed permission to visit local markets (we note similar impacts of the probability of visiting locations outside of the home). We also we find that the women displayed an increased (self-reported) confidence in talking to outsiders. This increase in mobility and confidence might be related to the increase in knowledge (the latter a direct result of the adult literacy program; consistent with Thomas et al. 1991). An increase in mobility and confidence might allow the women to, for instance, have a chat with the local nurse. Consistent with this hypothesis, we, as noted before, report an increase in number of times the women approached the local nurse.

In addition, we document small, but not insignificant changes in the woman's bargaining position in the household. While we cannot detect any significant effect on women's assts or whether or not the woman is the main (or any of the) decision-maker(s) in the household regarding, day-to-day, health and educational matters, most women (in both control and treatment) reported having a say in these matters. We also note an increased involvement

in purchases at the local market. In addition, when we presented the woman and her spouse with the specific decision-making problem as in the water tablet bargaining game, we note some subtle changes. At the start of the game, the preferences of the spouses were more alligned, and during the game, her husband was more likely to actively seek her opinion. However, we found no such effect when we presented the woman with a decision-making problem within the setting of her extended family, possibly pointing towards the stickiness of power relations within the institution of the extended family. We would like to emphasis that a change in bargaining power, or more general, in the position of the woman in the household, even if small, could potentially have significant impacts for future decision-making.

The rest of the paper is organized as follows. The next Section explains the specifics of the TA+ program. Section 3 details the sample, randomization and data collection. Section 4 presents the estimation methodology and results. Section 5 offers concluding comments.

2 The intervention

The intervention, Tara Akshar Plus (TA+) is implemented by a social enterprise named Development Alternatives (DA). One of the focuses of DA is to empower communities through strengthening people's institutions and facilitating their basic needs. It's under this mandate to empower communities that DA developed the TA+ program to impart functional literacy in rural and urban spaces.

TA+ is designed as a 56 day curriculum to provide literacy solutions to empower lives. It was referred to as the fastest literacy program in the world by Wall Street Journal in 2011. It is a computer-based program which imparts functional literacy in Hindi (the local language) and basic arithmetic. It functions via highly comprehensive software developed through stages of intensive grassroots level research and study of best practices globally. The specially designed classes are conducted by locally trained instructors in the women's own communities. The women are taught to recognize the sound of letters, syllables, numbers and form words and sentences using the Memory Hook technique embedded in animated movies and exercises. An example of memory hook technique would be how Hindi alphabets are taught explaining their link with objects that start with that particular alphabet. An illustrative English example would be to show the letter S as a snake curled in an S-shape. In this way, one gets reminded of the letter S every time one sees a snake-like shape. Beyond the structured curriculum, instructors and supervisory staff also hold discussions on general topics which affect the women's daily lives. A few examples of the topics covered include child nutrition, breast-feeding, Indian history and heritage, usage of mobile phones, hygiene practices etc. There is also a follow-up program named Gyan Choupali after the 56-day

TA+ curriculum. However, our study is focused on evaluating the impact of only the TA+ component.

TA+ runs for 56 days, six days a week, two hours per day. It is conducted in TA+ centres made temporarily available for the program within each hamlet (village subdivisions). TA+ is divided into two components: 37 days of the literacy component named 'Tara Akshar' and 19 days of the numeracy component named 'Tara Ganit'. The 37 days of Tara Akshar are further divided into 26 days of computer-based instruction at 100 minutes per day,[1] followed by 20 minutes of clearing doubts, checking notes, dictating homework etc., 10 days of practice sessions and an exam day where all women were assessed on their ability to recognize Hindi characters, write words, write phrases and sentences and apply reading and writing skills beyond the program coverage. Similarly, the 19 days of Tara Ganit had 18 days of instructional sessions, each lasting for 105 minutes,[2] and an exam day where the women were assessed on their numeracy skills.

We had set out a theory of change after understanding the structure of the program and after extensive formative research in the sample location. Since the TA+ program was primarily aimed at imparting literacy and numeracy skills, we expected these skills to have improved for the women who participated in TA+. The improvements in literacy and numeracy are reported in Deshpande et al. (2017). In this paper, we aim to assess and understand the impacts of TA+ beyond the immediate effects on literacy and numeracy.

TA+ caters to women whose interactions were mostly confined within their families. TA+ might have been the first opportunity for most of them to interact with other women without any inhibitions of being watched by older or male family members. One of our primary hypotheses was that this would lead to improvements in women's confidence to interact with people outside the family. In addition, we expected the TA+ women to have increased general knowledge due to, one, their increased ability to process such information, and two, the complementary discussions held on varied topics in the TA+ classes. Combining our

[1] Each 100 minute instructional session of Tara Akshar involved the following activities: a) 4 minutes of a video, b) 12 minutes of work with big flash cards with letters, characters, syllables or words, c) 20 minutes of writing practice, d) 20 minutes of work with small flash cards to facilitate recall of letters, characters, syllables or words introduced, d) 10 minutes of identification of the letters, characters, syllables or words by the women on the computer software, e) another 20 minutes of writing practice, f) 10 minutes of quizzes and practice through peer learning and g) 4 minutes of a follow up video.

[2] Each 105 minute instructional session of Tara Ganit involved the following activities: a) 13 minutes on a story, b) 10 minutes of work with big flash cards, c) 12 minutes of writing practice, d) 10 minutes of work with small flash cards recalling numbers introduced, e) 10 minutes of identification of the numbers by the learner on the computer software, f) 10 minutes of teaching learners on how to write numbers alphabetically, g) 10 minutes of repeating the digits taught and h) 30 minutes of writing practice.

hypotheses that the women would have increased their skill set, became more confident and that these changes would be acknowledged by their families, we expected that the program would affect (improve) the status of the women in their households, alter their mobility, and improve their bargaining position.

Finally, while we do not have any convincing measures of preferences, it should be noted that attending the TA+ program might have also changed the women's preferences, and perhaps aspirations for themselves and their children; by possibly attributing more value to education than previously. While self-esteem and improved knowledge are intrinsically valuable, we focus on their instrumental value, i.e. the possibility that increased knowledge and improved bargaining position may affect the choices of the woman and the families. In the rest of the paper, we refer to the outcomes mentioned above as 'mechanisms'.

We also made several hypotheses regarding final outcomes. We expected higher investments by the women in their children's education. Since the women acquired literacy and numeracy skills, we expected that they found them useful, and thus, they were more likely to realize the values of education. Additionally, since a lot of TA+ discussions focused on personal hygiene and health, we also expected the women to have improved hygiene practices and to be more vigilant about their children's health. In these final outcomes, however, we did not expect to see much in the way of impacts given that we tested for these within a short span of time after the TA+ intervention (about one year).

3 Research design

3.1 Sampling and randomization

TA+ is implemented by DA in eight states in the northern part of India. Our study was confined to the state of Uttar Pradesh across two of the three tehsils, namely Badohi and Gyanpur of Sant Ravidas Nagar District[3] where DA had planned to launch the TA+ program in June, 2014. The sample was drawn from nineteen hamlets across ten villages. The number of hamlets in each village ranges from one to three. These hamlets were chosen by DA and the research team since they were large enough to support a treatment assignment lottery with desired numbers in both groups. The hamlets in our study are caste-specific settlements. The societal norms impose severe restrictions on inter-caste interactions in the villages of our study. This necessitated the need for separate TA+ classes in each of the hamlets. The hamlets were thus the units of randomization. In each of the nineteen hamlets which form

[3]Districts are administrative divisions of a state and Tehsils are administrative sub-divisions within a district.

part of our study, DA through door-to-door visits compiled a list of all women between 15 and 45 years who were illiterate, had at least one child, and agreed to participate in the intervention, regardless of the time of implementation.

The baseline survey was conducted in April-May, 2014 with all the women on the list. After completion of the baseline survey in all the hamlets, the women were requested to assemble at a central location to participate in the public lottery. Every woman present was allotted a numeric identification number. These identification numbers were written in pieces of paper and put in a bowl. We then drew numbers from the bowl, one-by-one, and assigned the first set of women to the treatment group. These women were invited to attend TA+ classes in June-August, 2014. The remaining numbers picked were assigned control status. The control women were invited to attend TA+ classes in May-July, 2015.

Table 1 presents our sample divided between the treatment and control groups. These include 391 women from 331 households who were present during the public lottery and available during all three survey rounds.[4] Note that the treatment sample is larger than the control sample. This is by construction. The desirable number of women for a TA+ class is ten. Thus, we required at least 20 women from each hamlet to be assigned to the treatment and control groups. DA insisted in over enrolling women in the treatment group to take care of any potential dropouts by the time TA+ classes began. At the start of time of the lottery, the randomization process yielded thirteen women in the treatment group and ten in the control group, on average, in every hamlet.

3.2 Data collection

At baseline, we administered a household questionnaire to the head of household, and a women's questionnaire to all the women in the treatment and control groups. We also conducted tests of numeracy, literacy and cognitive ability among the women. The treatment women participated in TA+ classes in June-August, 2014. We administered a midline women's questionnaire and tests to all the women, immediately after the intervention in August-September, 2014. The endline survey was administered seven months after the completion of the TA+ classes in March-April, 2015. The endline survey included the women's questionnaires and the bargaining game. In addition, a randomly selected child of every woman was administered a literacy and numeracy test during endline. The control women

[4]Our baseline sample consisted of over 800 women. But upon learning more details about the program (which is time demanding) significantly fewer showed up at the public lottery. In addition, some women were not available for all three surveys. Table 1 present the final analysis sample. Note that 7 percent of women lived in households which had both treatment/control women.

participated in TA+ classes in May-July, 2015. In December, 2016, we conducted qualitative interviews with a selected treatment women to strengthen our understanding of the mechanisms. The survey instruments used across the multiple waves of surveys are detailed below.

3.2.1 Household questionnaire

The household questionnaire administered during the baseline was aimed to capture the woman's household structure and asset ownership, and included questions about age, marital status, caste, education and occupation of the various household members, land ownership, whether the household had access to electricity etc. These household characteristics form part of the covariates on which the treatment and control groups were balanced, as we show later.

3.2.2 Women's Questionnaire

The women's questionnaire had components related to health and educational practices, investments and outcomes, confidence in dealing with people, mobility, and their role in family decision making.

Health and education: The baseline and endline women's questionnaire canvassed information on the children's education and health status, and woman's involvement in these two aspects.

Education variables focussed on children between the ages of 4 and 19 years, and include the following: whether the child was enrolled at school, how many days the child was absent from school the week preceding the survey, whether the woman accompanied her child to school, whether the woman inquired about her child's homework, how much time the child spent on homework the day preceding the survey, and who, if anyone, helped the child with homework. We also conducted literacy and numeracy and cognitive tests with a randomly selected child, within the age group of 6-10 years, of each woman. We return to these tests below.

For all children under the age of 19, we asked questions which related to the child's health, including, whether the child fell ill anytime in the one month preceding the survey, whether the child received any medical treatment, whether the medical treatment received was within or outside the village, and whether the woman was present while the child was being treated.

Finally, a time use survey inquired about activities such as whether the woman spent

time to remind her children of homework, to help her children with homework, to talk to her children's teacher at school and to consult with the health care worker at the primary health centre.

In addition, the endline women's questionnaire captured the woman's health and hygiene practices. A few examples of variables on which data were collected include whether she covered vessel in which drinking water was stored, whether she treated water before drinking, whether she washed her hands after using toilet and whether she spoke to her children about the necessity of washing hands. We also captured fertility preferences (ideal number of children), female hygiene and contraceptive behavior, and basic knowledge of contraception.

Confidence, mobility and decision making: These sections of the questionnaire were the most innovative. While we took inspiration from existing studies such as the Indian Human Development Survey, the Indian Family Health Life Survey and the Young Lives Survey, we expanded the set of questions on household decision-making and mobility extensively, introducing also measures elicited through games. Each of these questions went through careful field-testing.

In the baseline and endline women's questionnaires, we had questions to capture the woman's self-reported confidence in dealing with people outside their families. We identified nine different people which the women would potentially have to deal with namely, male and female shopkeeper, contractor, Asha worker (always female)[5], Anganwadi worker (local health care provider, always female), village head, bank employee and male and female doctor or nurse. The respondent was asked how confident she felt in dealing with each of the nine different people listed above. Respondents had to choose between the following options, namely 'cannot even imagine dealing with the person', 'will never deal with the person', 'not confident in dealing with the person', 'somewhat confident in dealing with the person' or 'very confident in dealing with the person'. We assigned scores ranging from 0 to 4 for different levels of self-reported confidence. A score of 0 was assigned for the lowest level of confidence, when the woman expressed that she could not even imagine dealing with the person. The highest score of 4 was assigned when the woman expressed that she was very confident in dealing with the person. The confidence score for each woman was calculated as the summation of these scores across the nine different people. The maximum value which the confidence score could take was 36.

The baseline and endline women's questionnaires included questions on a woman's status in the household, asset ownership/use and household decision-making. The latter module

[5] ASHA is an acronym for Accredited Social Health Activist, who is an accredited social health worker, appointed by the Ministry of Health and Family Welfare, as a part of the National Rural Health Mission.

entailed asking the woman whether she was involved, consulted, able to express their views, feels their views are being taken seriously, is able to sometimes change the views of others, and had any (or all) say in the following matters: what to cook, what to shop (at the local market and outside of the village), what needs to be done when her child falls sick, child's school enrolment decisions and whether her child should attend school on any given day.

In addition, we inquired about the woman's mobility by asking whether they have engaged in certain activities, and, if so, whether they needed permission (and from whom), and whether they would be allowed to go by themselves. The listed activities include leaving the house, going to a shop within the village, going to a shop outside the village, visiting a primary health care centre, visiting the natal family, making phone calls to natal family, joining community groups, and/or going for cinema or other entertainment events.

3.2.3 Tests

During the midline survey, we conducted a knowledge test which had eight factual questions and four cognitive ones. The factual questions included listing the main cause of diarrhea, the recommended number of months of breast-feeding, the disease cause by iodine deficiency, the legal minimum age of marriage, and also questions on community knowledge, such as the nation's capital and the name of the Prime Minister. Two examples of the cognitive questions include the number of mangoes each child would get if twenty mangoes were to be equally divided among five children; and the name of the fourth son of Manoj's dad whose three sons are named Ram, Laxman and Shatrughana.[6]

At baseline, we administered two tests of cognitive ability to the women. The first test was the Forward Digit Span (FDS) test. This test provided a measure of short-term phonological memory, which typically served as a useful predictor of reading outcomes.[7] The second test was the Rapid Automatic Naming with Colors (RAN) test. It was a test for measuring lexical access speed and engagement-disengagement dynamics.[8] The results of the FDS and

[6] These are famous characters from the legend "Ramayana".

[7] In this test, we orally provided the women with random sequences of digits and asked respondents to recall them in the same order as they had received them. The length of the sequences increased gradually. The administration of this test stopped when the respondent obtained two scores of zero over two consecutive items.

[8] In this test, the respondents were shown 6 rows of four squares coloured Blue, Red, Yellow and Green. They were then asked to name the colours of each square as quickly as they could. Learners could use local names for the colours. The task involved 4 primary colours, and the colour squares were randomly arranged in a matrix on the page. This test was administered twice with different random matrix arrangements in order to estimate the reliability of the measure (so a total of 24 * 2 squares). The time taken by the women to complete the test was captured as well as the number of errors they made.

RAN tests also form part of the covariates which we later establish as balanced between the treatment and control groups.

At both endline, we also administered literacy and numeracy tests to a randomly selected child within the age group of 6-10 years of each woman. The literacy tests were developed, tried, and tested by Pratham, based on the model used in the DIBELS (Dynamic Indicators of Basic Early Literacy Skills) tests (Good et al., 2001). The literacy tests were timed tasks. The children were given one minute to read 52 letters (Task 1), 63 syllables (Task 2), 52 words (Task 3), 48 non-words (Task 4), and a 64-word Grade 1 level paragraph (Task 5) and a 94 word Grade 2-level paragraph (Task 6). On Task 5, examiners marked as correct/wrong only those words read within a minute, but they allowed the children to complete the paragraph after the first minute so that they could answer the comprehension questions. The test also included a number of "discontinuation rules", so the test would not progress to more difficult tasks if the children could not achieve a minimum level on an earlier task. The numeracy tests were not timed. Children were asked to complete eight tasks namely count three objects orally, recognize single-digit numbers ranging from 0 to 9, recognize 10 randomly selected two-digit numbers, count objects and circle the correct written number, count objects and write the correct number, fill in the missing digit in two series, add two to three one- and two-digit numbers and subtract one- and two-digit numbers. Based on the results of these eight tasks, we created an overall math score. In addition to these, we also conducted a RAN test with the selected child.

3.2.4 Bargaining game

At endline, we conducted a game to investigate the woman's influence over the household decision-making process. In this game, we first asked each participant in the experiment to make a decision individually; after which we brought the various participants together and asked them to revisit their original decision and come to a joint conclusion. This approach is similar to the one implemented by De Palma et al. (2011), Carlsson et al. (2013) and Braaten and Martinsson (2015), in which relative bargaining power is determined by examining the influence of individual preferences on a couple's joint preferences, and inferred from the difference between decisions made individually and jointly by a husband and wife. A unique feature of our design is that, in addition to simply capturing preferences, we also record the process by which the individuals came to a joint decision.

First, we gathered the woman and her spouse.[9] After agreeing to participate, we read

[9]For almost half of the women we were unable to conduct this experiment as the spouse was not present at the time of the interview. Whether or not the spouse was present does not correlate with the treatment status, but appears to be largely determined by the spouse's migration status and the woman's age.

the following instructions to them:

> I am going to play a simple game with the two of you. It doesn't matter if you are literate or illiterate to play this game. We shall give you a few gifts for your time, at the end of the game. Imagine you have got just Rs.30 with you, with which you go to the market. There are only two things available in the particular shop you go-rice (show them the rice) and chlorine tablets which are used to clean water (show them the chlorine tablets). You may be used to drinking water from hand pumps or wells. But that water may have a lot of bacteria which you cannot see with your naked eyes, which is the primary cause of many diseases like diarrhea, cholera etc. This chlorine tablet (show them the tablet again) can purify two full buckets or 20 liters of water. The price of one chlorine tablet is Re.1 and this rice costs Rs.30 per kilogram. You have to exhaust the entire Rs.30 at this shop itself. You can't save anything out of this Rs.30. How will you spend the Rs.30 between rice and tablets? You don't have to tell your decision now. I will ask you both separately.

Prior to conducting the game, we had extensively field tested this protocol. We found that rice performed a similar role as cash since it can be easily bought and sold in the village and is valued by both husband and wife. As the NGO and local government officials were not keen on us using cash in the villages, we opted for rice as a substitute for cash. Consistent with this reasoning, we priced the rice at the average village market price. Water tablets were a less familiar commodity. In effect, only 8 percent of the women had heard about them versus 20 percent of men (see Appendix Table 3). Previous research suggested that preferences for health goods might differ by gender, and hence the combined features of unfamiliarity yet likely differential preferences made water tablets a good choice for this game.

Once we read out the instructions, and answered any questions that they had, we separated the participants to ensure they could not hear or see each other's choices, and mentioned that their choices would never be shared with the other person. We asked each participant how they would like to split Rs.30 (about 0.8 USD) between the rice and the water tablets, emphasizing that there is no right or wrong answer. We recorded their answer and then brought them together. The enumerator continued:

> Imagine now both of you go to the market together with just Rs.30, which has to be exhausted on rice and water tablets. You already know the price of each which is Re.1 for 1 tablet and Rs.30 for a kilogram of rice. Now tell me how will

you split the Rs.30 between rice and tablets, if you were to do it together? You may want to consult each other before sharing your final decision.

Following this statement, the participants were allowed to discuss and convey a mutually agreed upon manner to split the money. In addition to recording the independent and collective decisions, the process of discussion was captured as well. We collected information on who spoke first, what the content of this first statement was (in particular, whether this first statement dictated the valuation, sought the valuation of the other person, or suggested who should decide) and who spoke last. Once the joint decision was made, we paid out the participants in rice and water tablets as per joint decision.

We also conducted a similar game with the entire extended family. In this game, we asked the members of the extended family to provide us with a willingness-to-pay for a children's book, both separately as well as jointly. We find little impact on any aspects of this game, and due to small sample size issues, decided not to include the results of this game in this paper.

3.3 Descriptive statistics

The process of selecting participants in the treatment group through a lottery was meant to create two groups with very similar observable and unobservable characteristics. A standard check to determine whether the randomization procedure was conducted properly involves investigating whether these two groups have similar observable characteristics at baseline. If one lottery had been held for all potential participants across all villages, then a simple t-test would have been appropriate. However, as Duflo et al. (2008) note, one should include subgroup indicators (called strata) in the regression in this case.[10] This is also true for baseline balance tests. In our case, the strata fixed effects indicate the hamlet where the respondent lived or attended class.

Table 2 reports the baseline of the women in the treatment and control groups, as well as whether the difference between the two groups is significant. Focussing on the women in the control group, the average age of the women was 36 years, and they had on average, three children. The average FDS test score was 5.5 out of a maximum possible score of

[10] Technically speaking, whether it is necessary or simply advisable to include strata fixed effects depends on whether the same proportion of participants is chosen in each lottery. Athey and Imbens (2017) note that including strata fixed effects for different lotteries generally lowers the estimated standard errors for the estimated coefficients, and is therefore advisable. When the lottery is conducted for separate subgroups separately and the number of participants chosen for the program as a proportion of all possible participants differs by subgroup, it is necessary to include strata fixed effects to avoid biased results

16. The average time taken by women for the RAN test was 82 seconds, and they made two errors on average. Each woman's household, on average, had a holding of 0.5 acres of land. There were 11 members in every household, on average with an average number of five adult members. 17 percent of the households had access to electricity. Given that TA+ program targeted disadvantaged groups, it is no surprise that 45 percent of the households belonged to Other Backward Classes (OBCs) and 50 percent of the households belonged to Scheduled Castes (SCs).[11] Column (5) of Table 2 which reports the P-value of a regression of the variable of interest on the treatment dummy indicates that the treatment and control groups are balanced on all these characteristics. In the regression specification, we control for all the characteristics of Table 2.[12]

The remainder of Table 2 presents the balance test of selected dependent variables. Recall that not all dependent variables were elicited at baseline; hence we opt to focus this table on the variables which relate to the women's mobility and decision making. The first set of variables relate to the women's asset use, and correspond, respectively, to the questions: In the last two weeks, have you taken a shared auto/public transport to anywhere?, Do you personally own a mobile phone which you carry at all times?, Do you have a bank account in your name?, Do you get to keep your jewelry with yourself? and also the use of veils asked trough the question: Do you practice ghungat / purdah/ pallu? We note relatively high levels of assets across the board, and a uniform use of veils. There are no statistical significant differences between the two groups of women.

The two groups are also balanced in the proportion of women who were the primary decision makers for specific household decisions. Focussing on the control group again, 49 percent of the women reported that they were the primary decision-maker on what to cook on a daily basis, 39 percent reported that they were the primary decision-maker on what and how much to purchase from the local market, 37 percent of the women were the primary decision maker on what and how much to purchase from the market outside the village, 38 percent of the women were the primary decision maker as to what had to be done when their children fell ill, 31 percent were the primary decision-maker on their children's school enrolment decisions and 41 percent were the primary decision-maker as to whether their

[11] There are more than 6000 caste (jati) groups in existence. The constitution of India proclaims it as a "caste-less" society, and legally, caste is recognized as a category only for the purposes of affirmative action, namely, the most disadvantaged castes, are identified for quotas in state-run educational institutions, government employment and at all levels of election. These castes are listed in a government schedule, and hence called Scheduled Castes.

[12] Appendix Table 1 reports the summary statistics of selected outcome variables at baseline and also whether any difference between the treatment and control groups along these baseline outcomes is significant. The two groups are balanced on all mobility related outcomes, except three.

children should take a leave from school on a particular day.

Recall that the decision making module in the questionnaire has fairly rich information on the decision making process in this realms. If we look at the percentage of women who are consulted for the decisions above, these percentages are significantly higher, between 80 and 90 percent. Similarly, when we look at the percentage of women who have any say at all in these, the percentages are between 45 and 60 as well. We see a detailed analysis of these different ways to look at decision making as a fruitful avenue for future research, and return to this point in the discussion.

The last set of comparisons relate to the women's mobility. The first set of statistics relate to the question as to whether the woman was engaged in certain activities, and, the second set of statistics relates to whether they needed permission (conditional on having engaged in the activity). This time, we note some statistical differences between the two groups of women. Focussing on the women in the control group first, 75 percent of the women reported that they had moved outside their house, 46 percent of the women had visited the local market within the village, 38 percent of the women had visited a market outside the village, 78 percent of the women had visited the primary health care centre within the village, 98 percent of the women had visited their natal family, 93 percent of the women had made phone calls to their natal family, 16 percent of the women had joined some form of community groups, and 72 percent of the women had gone for some cinema or other entertainment events. Whether permission was needed or not strongly depends on the activity in question. The woman generally does not need permission for calling her natal family by phone, or doing household shopping; but tends to need permission for all other activities. The control group differs from the treatment group along the first measure, in particular in the areas of going to markets outside of the village, visiting the natal market, or going for personal entertainment. In particular, it appears that the women in the control group enjoy more mobility along these dimensions. As the control women do better than the treatment women, it is possible that our estimates in this realm are biased downwards.

Table 3 reports the summary statistics of characteristics of all the children of the sample women, and reports whether the difference between the children's characteristics of women from the two groups is significant. Focussing again on the control group, the average age of children was nine years. Half of the children were girls. Among the children between 5 and 16 years, children had, on average, four years of education. 92 percent of the children are enrolled in school at the time of baseline survey. 54 percent of the enrolled children attended school on all seven working days preceding the day of the baseline survey. Only six percent of the children were taken to the school by their mothers. Mothers of 69 percent of the children inquired about school homework. 63 percent of the children spent at least one hour

on homework daily. Eight percent of the children received help from some other educated member of the family, which usually was a sibling or a cousin.

Looking at the health indicators, and focussing on the children up to the age of 16 years, 36 percent were noted to be ill at any point of time in the past 30 days preceding the survey; conditional on being ill, almost all children have received some form of treatment, in the majority of cases outside of the village with the mother present during the treatment.

Column (5) of Table 3 which reports the P-value of a regression of the variable of interest on the treatment variable indicates that the treatment and control groups are balanced on every single characteristic of the children, except for the time spent on homework, where the children from mothers in the control group, again, do significantly better. We control for child age, birth order, child gender and an interaction term between child gender and age have been controlled in our later analyses.

4 Analysis and results

4.1 Regression methodology

In the previous section, we showed that the covariates are largely balanced between treatment and control groups. We now present a simple treatment effect model before implementing instrumental variables. Consider the following regression, where y_{ij} denotes the variable of interest of woman i located in hamlet j:

$$y_{ij} = \alpha + \beta_{ITT} ITT_{ij} + \mu_j + \epsilon_{ij} \tag{1}$$

ITT_{ij} is an indicator variable that takes a value of 1 if the woman was assigned to the treatment group and a value of 0 otherwise. Because all the women did not necessarily comply with this assignment, the variable β_{ITT} captures the intent-to-treat effect, that is, the effect of being assigned to treatment. The variable μ_j is the specific hamlet part of the error term (i.e. the strata) and ϵ_{ij} is the individual-specific part of the error term.

Next, include a set of individual- and household-specific control variables that convert Equation (1) into regression equation (2):

$$y_{ij} = \alpha + \beta_{ITTC} ITT_{ij} + \gamma X_i + \mu_j + \epsilon_{ij} \tag{2}$$

The variable β_{ITTC} captures the intent-to-treat effect with the control variables. These control variables include the women's age, the women's baseline FDS/RAN test scores, the women's number of children under the age of 16, whether the women belongs to Other Backward Castes or Scheduled Castes, land owned by woman's household, number of household

members, number of adult household members, and whether the household has access to electricity.

Our treatment assignment was not fully complied with: 47 percent of the women assigned to the treatment status did not participate in the program, and 0.04 percent of the women assigned to the control status, ended up participating in the program as is evident from Table 1. Therefore, intent-to-treat will be an underestimate of the program for those who participated in the treatment. Hence, we implement an instrumental variables (IV) strategy in which participation in TA+ is instrumented by assignment to the treatment group. In the first stage, we regress participation in TA+ on assignment to the treatment group and the other control variables:

$$TA_{ij} = \alpha + \beta_{Stage1} ITT_{ij} + \gamma_{Stage1} X_i + \mu_j + \epsilon_{ij} \tag{3}$$

The instrumental variables approach then uses the predicted values instead of treatment assignment as an independent variable in the second stage:

$$y_{ij} = \alpha_{IV} + \beta_{IV} \hat{TA}_{ij} + \gamma_{IV} X_i + \mu_j + \epsilon_{ij} \tag{4}$$

Where the standard errors are adjusted to take into account the predicted first-stage regression. The coefficient β_{IV} captures the local average treatment effect, which is the average effect of TA+ among the compliers. This is our preferred specification.

4.2 Results

4.2.1 Impacts on health and education

The qualitative interviews revealed that TA+ had impacts over a wide range of outcomes. In particular, women noted that the program had not only increased their ability to read, write and count, but also resulted in greater self-confidence, increased respect within the household, greater bargaining power, increased mobility and increased knowledge about educational and health matters.

Tables 4-7 present the results of the IV estimation; the second stage regression equation (4). The first stage regression equation F-statistics is reported in these tables. We note that the F-statistics is usually above 200, indicating that weak instruments are not an issue of concern (Stock and Yogo 2002 and Murray 2006).

Table 4, Columns (1)-(4) and (8) presents the effect of TA+ on the women's health and hygiene practices. Among hygiene practices, we see significant impacts on two of them in particular. TA+ participation increased the probability of women covering vessels in which

drinking water is stored by 18 percentage points. This is significant at the 1 percent level of significance. TA+ participation also increased the probability of women washing hands with soap after using toilet, by 14 percentage points. This is significant at the 5 percent level of significance. We did not note any effects on treating water before drinking or telling children to wash hands after defecating. While not reported in Table 4, we noted no impacts on fertility preferences, fertility knowledge or contraceptive use. Recall that the TA+ classes included topics of hygiene, but not fertility, so these differential impacts were to be expected. Finally, TA+ participation increased the probability of women spending time to talk to the health care worker, or doctor, or nurse by 14 percentage points. This is significant at the 10 percent level of significance. This is expected since the TA+ discussions focused on the need to monitor one's own health and the role of health workers.

Table 4, Columns (5)-(7) look at woman-level educational investments, i.e. home schooling. We note that TA+ participation increased the probability of women spending time in helping their children with homework by 11 percentage points. This is significant at 5 percent level of significance. The probability of women spending time to remind their children about homework has increased as well due to TA+ participation, although this is (just) not statistically significant. This is in line with how almost all the women in our qualitative surveys expressed that after attending TA+ classes, they realized the importance of educating their children. In addition, many women with young children in particular mentioned that they enjoyed studying along with their children after TA+ participation. This corresponds with the increased involvement of the women with their children's homework in particular.

Table 5 presents the effect of TA+ on children's educational investments and outcomes using the child-level data. The advantage of child-level data is that one can consider child-level investment, considering the child's age, sex and birthorder. To avoid issues with children leaving the home due to marriage, we only consider children between the ages of 6 and 16. This yields a sample size of 722 children. We see that in the endline, there is no difference between treatment and control groups in terms of children's current enrollment. The time span of our study likely plays a role here, as one year might not be enough to see any effects on educational attainment. But conditional on current enrolment, we observe some differences in the mothers' involvement with their child's education. We note again that TA+ participation increased the probability of asking one's child about homework in a week by 19 percentage points. This is significant at the 1 percent level of significance. However, TA+ participation reduced the probability of women dropping their children at school in a week by 3 percentage points and reduced the probability that the child spends at least one hour a day on homework by 11 percentage points. This is significant at the 5 percent level of significance. One possible interpretation of this might be that treated mothers are

more confident overall, and one manifestation of that confidence is their greater awareness about the environment. This might reflect itself in the realization that their children are capable of going to school on their own, and hence they are less likely to be afraid of letting them go to school on their own. The result that TA+ participation reduced the probability that the women's child spends at least one hour a day on homework is indicative of possible Hawthorne effects in the responses of the women in the control group. The control group women might have over reported the hours their children spent on homework daily.

In Appendix Table 1 we show that TA+ participation did not have any significant impact on the literacy and numeracy test results of the woman's children. This also, might not be surprising given that we would expect some impact on these outcomes only in the longer run and not within one year after the baseline, when the endline tests were administered on the children. This null effect is also consistent with the modest results of Banerji et al. (2017).

In Table 6, we present the results on children's health investments and outcomes. Here, we only consider children under the age of 16, which yields a sample size of 994 children. We note that TA+ participation did not have any impact on the women's investment in their children's health outcomes. There was no change in the probability of the child falling sick, and conditional on falling sick, in the probability of the child receiving medical treatment, or in the probability of woman being present when the child was treated. During the qualitative interviews, the women noted that they always took sick children to primary health centres located within or near the village, which provide free medical services. This was, thus, likely, not a relevant margin to base our analysis. As few of the children were reportedly treated at private facilities, we are unable to test the impact on health expenditures an the like.

4.2.2 Impacts on mechanisms

An important component of the qualitative surveys was to inquire about possible mechanisms to explain the effects, or reasons to explain some of the lack of effects. During these surveys, many of the women mentioned how TA+ participation improved their self-esteem, and relatedly, increased their status in the household. Women noted that their voice matters more, in within household discussions, with some mentioning that they were no longer casted off as the illiterate in the household. Many women mentioned that the ability to count better, together with their increased confidence, resulted in a situation where they can now do much more of the daily household shopping.

In Tables 7 through 11 presents the impacts of TA+ on the various mechanism indicators. From Table 7, we note that TA+ participation did not have any impact on status variables like woman having to wear a veil, whether the woman could keep her jewelry with herself,

whether the woman had a personal mobile phone, whether the woman used a vehicle, and whether the woman had a personal bank account. In Table 8, we present the impacts on household decision-making. Note that the information we collected on household decision-making can be aggregated in many different ways. For instance, one can look at whether the woman is involved in a certain activity, or create an index of the degree of her involvement, or whether she has self-expressed any say or the most say in any decision. In Table 8, we opted for the variable 'whether the woman is the main decision-maker'. We note that TA+ participation did not have any impact on this variable on matters like what to cook, what to shop, what needs to be done when her child falls sick, the child's school enrollment decisions and whether the child should attend school one day. We note similar insignificant results when we create an index of the woman's degree of involvement. In effect, the only effect we noted was an increase in the degree of involvement 'what and how much to purchase at the local market' (This Table is not included in the results presented).

Table 9 presents the first set of results on mobility. We note no significant impact of TA+ participation on whether women performed a range of activities, apart from 'Going to a local store', where we noted an increase in 14 percentage points (statistically significant at the 10% level). Conditional in engaging on these activities, columns (1) through (8) of Table 10 presents the impact of TA+ participation on whether the women were exempted from seeking permission. TA+ participation increased the probability of women not having to seek permission to make phone calls to the natal family by 21 percentage points. This was significant at the 1 percent level of significance. TA+ participation increased the probability of women not having to seek permission to go to the local shop by 18 percentage points. This was significant at the 10 percent level of significance.

To complete our discussion on the position of the woman within the household, Table 11 presents the results of the spousal bargaining game. We present the results among all aspects of the game, from knowledge of water tablets, over individual and joint preferences, to the process by which a decision was reached. We note while that the TA+ program did not impact the preferences of the woman and her husband (in Columns (1) and (2), respectively), the discrepancy between their preferences might have decreased, as measured in Columns (3): while not statistically significant, the P value is 0.13 and the magnitude of the coefficient is not small: 5 percent.

We use the difference between the individual preferences and the joint preference to estimate the woman's bargaining power in the game. In the Appendix, we set up a simple Nash Bargaining game and derive a measure of the woman's bargaining power λ from these preferences.

We restrict the sample to the couples with λ within the acceptable range of $[0, 1]$ for

Columns (4) and (5), but do not note a statistically significant impact on either the value of λ or the discrete counterpart. We do, however observe a change in the decision-making process. While, in most cases, the spouse speaks both first and last (see Appendix Table 3 for the descriptive statistics of this game), and this is not something which appears to have been altered by the TA+ program, the first speaker is now 20 percentage points more likely (P-value 0.7-08) to seek the other person's valuation rather than to dictate a valuation.

Finally, and perhaps somewhat oddly, while TA+ program did not affect the probability that the woman had heard about water tablets, the spouse seem to have an increased knowledge, due to the TA+ program. We are yet to attribute an explanation to this - it might also suggest an inclined tendency to more carefully listen to what the spouse, i.e. the woman, has to say after she returns from the TA+ classes each day.

We did not include the results of the family bargaining game in this paper. Note that, in this case, there is no straightforward manner to capture the bargaining position of one individual. When we repeat a variation of the previous analysis, we note no statistically significant effects. In addition, the effects on the preferences of the participants, the difference in preferences, or the decision-making process is quite imprecise. Given the significant attrition issues in this game, we opted not to include the results in this paper.

Columns (9), (10) and (11) of Table 10 presents the impact of TA+ participation on knowledge test scores. Recall that this test was conducted at midline, which accounts for the slightly lower sample size - 356 women. TA+ participation increased the test score by 2.8 points which corresponds to a 23 percent increase. This is significant at the 1 percent level of significance. TA+ participation increased the factual knowledge score by 2.3 points which corresponds to a 29 percent increase. This is significant at the 1 percent level of significance, as well. TA+ participation increased the cognitive test score by 0.5 points which corresponds to a 13 percent increase. This is also significant at the 1 percent level of significance. The larger impact on factual questions, highlights the effectiveness of the TA+ discussions on varied factual topics. The factual questions, thus seemed to be a direct application of what the women were exposed to in their classes. We also noted no impacts on either fertility preferences or knowledge (These results are not included in the paper).

Finally, Column (12) of Table 10 presents the impact of TA+ participation on the woman's confidence in dealing with people outside their families. TA+ participation increased the confidence score by 2.2 points, which corresponds to a 6 percent increase. During our qualitative survey, women reported that before TA+ participation, they used to seek the help of their older children or nephews to accompany them when they took their younger children to the health centre. Ever since they participated in TA+, as TA+ instructors kept encouraging them to interact with health workers on their own, many respondents reported

to have gained confidence to go on their own.

5 Conclusion

Given that 37 percent of illiterate adults are in India (UNESCO, 2014), the evidence from India is critical in terms of our understanding of the broader, intergenerational impacts of adult female literacy. As mentioned earlier in the paper, although evaluations of adult literacy programs do exist, the body of rigorous evidence is small. Our paper directly contributes to this small body of literature by evaluating the impact of an innovative computer based adult literacy program named Tara Akshar+ (TA+) over a wide range of outcomes and the mechanisms which underlie the theory of change.

TA+, implemented by the NGO Development Alternatives (DA), has a 56 day curriculum focusing on imparting basic literacy and numeracy skills to its participants. With such a short program, it would be hard to imagine that the participants would have gained anything beyond basic literacy and numeracy skills. But our results show that DA does have impacts beyond these basic skills. We document an improvement in women's health and hygiene practices and an increased involvement of the women in their children's education. We find little effects, however, on other health investments and more traditional measures of educational investment, such as school enrollment and attendance.

TA+ participation does result in significant impacts on the mechanisms which underlie the theory of change. Women have increased general knowledge of health and educational matters and increased confidence in dealing with people outside their families. Within their households, women were more likely to be exempted from seeking permission to leave the house. While making decisions with their spouse, there was an increased probability that the women would be consulted, and not dictated.

Not all our measures of the woman's status and power in the household showed positive impacts. This can likely be attributed to a combination of two factors: First - measuring these changes is not straightforward, and the specificity of the questions, respondents and context can dominate the range of answers one can expect (Quisumbing and de La Brière 2000, Almas et al. 2018). Second - an increase in status might not result in an increase in power across all dimensions; instead, women opt to exert their power in selected domains only (as suggested by Heath and Tan, Forthcoming), or among selected family members only (for further discussions on India's extended family structure see among others, Anukriti at al. 2020, Debnath 2015), or the household might move towards joint decision-making (as in Kafle et al. 2018). Or, perhaps, we have to reconsider the fundamental tenants of our intra-household models and take dynamic, flexible approach to preferences, bargaining power and

relations (see Ligon 2012, Munro 2015 and Doss and Quisumbing 2019 for insights).

We attribute these impacts on the mechanisms to primarily two aspects of TA+. First, TA+ enabled the women to move out of the house to assemble at a central location to attend the classes and to interact for a longer time with people outside their family. Second, a more important aspect of the TA+ is the complementary discussions on a wide variety of topics, which have proved extremely influential on the women. As a policy recommendation, it would be important to have these two aspects in place for any adult literacy programs, complementing the literacy and numeracy components, to see similar results on mechanisms. In addition it is useful to remind ourselves that while India has been successful in raising the primary enrollment rates of boys and girls through programs such as Sarva Shiksha Abhiyan and mid-day meal, adult education programs, such as the well known National Literacy Mission, aiming at increasing adult literacy, has been met with limited success (Kapur and Murthi 2009). This implies that the TA+ program cannot be a replacement for regular schooling of women. Nevertheless, our results highlight that TA+ is a great opportunity for all those women who missed their chance to go to regular school.

Keeping in mind the short duration of the evaluation (about one year), the fact that we found strong, significant impacts on knowledge formation, confidence and women's mobility are encouraging results. We can only speculate that an evaluation, if it were done in ten years, would possibly show more significant impacts on the next generation. For example, mothers might become more confident in dealing with the local school system, which could by increasing accountability, improve the quality of education, as in Gertler et al. 2012 in Mexico. Or mothers could join the labor market, positively impacting their families (as in, for example, Luke and Munshi 2011). Overall, if these projects are done at scale, one might expect changes in gender-based social norms which in their turn could have significant impacts on these societies (as suggested by Jayachandran 2015, and demonstrated by Bursztyn et al. 2018 in Saudia-Arabia).

In addition to a longer-term analysis, a more complete analysis would also need to consider spillovers. Our results reveal one instance of spillover of what the women were exposed to in TA+ classes to other family members. In the bargaining game results, we note that the spouses of women who participated in TA+ were more likely to be aware of the use of water purification tablets. There were discussions on water purification tablets in the TA+ classes. While we are limited by data constraints; only 7 percent of women live in households with both control and treatment women, and we have no information on social networks between households, we are acutely aware of the need to study the role of "proximate" literacy (as in Basu et al. 2001) and spillover effects within hamlets and villages.

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Appendix

We analyse the results of the spousal bargaining game by comparing individual preferences with the joint preferences. Assuming a Nash Bargaining model, we allocate a Nash bargaining weight of λ to the woman, as follows:

$$\lambda U_F + (1 - \lambda)U_M = U_J \tag{5}$$

where U_F denotes the preferences of the woman, which in this case is her choice of number of water tablets to purchase, and U_M denotes the preferences of her spouse, i.e., his choice of the number of water tablets to purchase. The bargaining weight of the woman, λ, can be obtained via:

$$\lambda = \frac{(U_J - U_M)}{(U_F - U_M)} \tag{6}$$

Note that $0 \leq \lambda \leq 1$, with $\lambda = 0$ indicates that the woman has no bargaining power, and $\lambda = 1$ represents a situation in which it is the woman who has all the bargaining power. Before we proceed, consider the distribution of λ in Appendix Table 2. Note that for 23 percent of the couples, we recorded the same preferences, hence this λ cannot be computed in these cases. For about 14 percent of the couples, the λ was outside the acceptable range $[0, 1]$. If taken at face value, this would imply that the process of negotiation itself might have changed individual preferences, i.e. persuasion has taken place. More likely perhaps, the experiment might not have been understood by these participants. Notably, for the couples who have a λ within the acceptable range, the large majority reports $\lambda = 0$ or $\lambda = 1$. While this might suggest extreme levels of bargaining power, to us, this more likely suggests that experiments such as these one, only measure one dimension, and is unlikely to represent a comprehensive assessment. We return to the difficulty of measuring bargaining power in the conclusion.

Table 1: Treatment assignment and participation status

	Participated in TA		
	No	Yes	Total
Treatment status			
Control	170	7	177
Treatment	81	133	214
Total	251	140	391

Notes: This table present the sample and randomization

Table 2: Balance test - women

Variable	Control		Treatment		P-value
	Mean	St. Dev.	Mean	St. Dev.	
	(1)	(2)	(3)	(4)	(5)
Control variables					
Age of woman (years)	36.04	9.38	34.66	10.41	0.11
FDS total	5.54	1.58	5.79	1.58	0.16
RAN time	82.20	30.40	81.28	27.44	0.98
RAN error	2.30	4.61	1.98	4.42	0.92
Number of children	3.06	1.44	2.68	1.37	0.24
Acreage land owned	0.45	0.72	0.57	1.16	0.56
Members in the household	10.94	7.36	10.61	7.07	0.36
Adult members in the household	5.34	4.18	5.28	3.91	0.51
Whether the house has electricity	0.17	0.38	0.13	0.33	0.31
Belong to OBC	0.45	0.49	0.53	0.50	0.18
Belong to SC	0.51	0.50	0.43	0.49	0.26
Dependent variables					
Assets (Binary variables)					
Use vehicle	0.32	0.47	0.31	0.46	0.87
Personal mobile	0.44	0.50	0.46	0.50	0.69
Personal bank account	0.46	0.50	0.47	0.50	0.75
Keep jewellery with yourself	0.81	0.39	0.73	0.45	0.12
Use veil	0.99	0.11	0.96	0.19	0.10

Notes: This table presents the descriptive statistics and the results of a balance test. Columns (1) and (2), respectively, present the mean and standard deviation for the control sample. Columns (4) and (4), respectively, present the mean and standard deviatio for the treatment sample. This table includes all control variables and selected dependent variables. Column (5) presents the P-value of a regression on the treatment variable. This regression includes hamlet (strata) fixed effects and robust standard errors.

Table 2: Balance test - women (continued)

Variable	Control		Treatment		P-value
	Mean	St. Dev.	Mean	St. Dev.	
	(1)	(2)	(3)	(4)	(5)
Is the woman the main decision-maker regarding					
What to cook on a daily basis?	0.49	0.50	0.49	0.50	0.88
What and how much to purchase at the local shop/market?	0.39	0.49	0.41	0.49	0.96
What and how much to purchase at the market outside the village?	0.37	0.48	0.34	0.47	0.56
What to do when your child falls ill?	0.38	0.49	0.36	0.48	0.51
Whether your child is enrolled in school a particular year?	0.31	0.46	0.31	0.47	0.86
Whether your child attends school a particular day?	0.41	0.49	0.42	0.49	0.88
Has the woman ever done activity:					
Leaving the house	0.75	0.44	0.72	0.45	0.54
Going to a local shop/market (kirana)	0.47	0.50	0.44	0.50	0.61
Going to a market/shop outside of the village	0.38	0.49	0.28	0.45	0.05
Visiting a primary health care center	0.78	0.41	0.70	0.46	0.12
Visiting natal family	0.98	0.13	0.95	0.21	0.08
Making calls to the natal family	0.93	0.25	0.92	0.27	0.40
Joining any community groups (e.g. a Self Help group)	0.16	0.36	0.08	0.28	0.27
Going for mela/personal shopping/cinema (entertainment)	0.72	0.45	0.59	0.49	0.01
Does the woman not need permission for:					
Leaving the house	0.17	0.37	0.15	0.35	0.75
Going to a local shop/market (kirana)	0.77	0.42	0.71	0.46	0.35
Going to a market/shop outside of the village	0.45	0.50	0.45	0.50	0.79
Visiting a primary health care center	0.23	0.42	0.18	0.39	0.25
Visiting natal family	0.09	0.28	0.09	0.28	0.94
Making calls to the natal family	0.81	0.40	0.78	0.42	0.55
Joining any community groups (e.g. a Self Help group)	0.08	0.28	0.14	0.36	0.61
Going for mela/personal shopping/cinema (entertainment)	0.15	0.35	0.18	0.38	0.40

Notes: Columns (1) and (2), respectively, present the mean and standard deviation for the control sample. Columns (4) and (4), respectively, present the mean and standard deviatio for the treatment sample. Column (5) presents the P-value of a regression on the treatment variable. This regression includes hamlet (strata) fixed effects and robust standard errors.

Table 3: Balance test - children

Variable	Control		Treatment		P-value
	Mean	St. Dev.	Mean	St. Dev.	
	(1)	(2)	(3)	(4)	(5)
Child age (years)	8.91	4.67	8.65	4.56	0.24
Gender (1=female; 0=male)	0.50	0.50	0.50	0.50	0.63
Birthorder (order of birth)	2.38	1.38	2.26	1.25	0.15
Educational investments and outcomes					
Education (in years)	4.60	3.06	4.55	2.99	0.61
Currently enrolled in school (1=yes; 0=no)	0.92	0.27	0.94	0.23	0.38
No absence from school in last 7 days (1=yes; 0=no)	0.54	0.50	0.53	0.50	0.30
Mother drops of child at school (1=yes; 0=no)	0.06	0.23	0.03	0.17	0.24
Mother asks child about homework (1=yes; 0=no)	0.69	0.47	0.73	0.44	0.41
Child spends at least 1 hour on homework daily (1=yes; 0=no)	0.63	0.48	0.58	0.49	0.07
Mother helps with homework (1=yes; 0=no)	0.00	0.00	0.01	0.07	0.17
Child receives any help with homework (1=yes; 0=no)	0.07	0.25	0.07	0.26	0.74
Health investments and outcomes					
Not sick in the last 30 days	0.74	0.43	0.73	0.44	0.62
Received treatment when sick	0.98	0.30	0.94	0.22	0.13
Received treatment outside of the village	0.58	0.49	0.66	0.47	0.55
Mother attended treatment	0.65	0.47	0.57	0.49	0.30

Notes:This table presents the descriptive statistics and the results of a balance test. Columns (1) and (2), respectively, present the mean and standard deviation for the control sample. Columns (3) and (4), respectively, present the mean and standard deviation for the treatment sample. Column (5) presents the P-value of a regression of the variable on the treatment variable. This regression includes hamlet (strata) fixed effects and robust standard errors. For the educational variables only children between the ages of 5 and 16 are included. For the health variables only children up to the age of 16 years are included. Rows after 'currently enrolled' are conditional on the child currently enrolled in school; and the rows after 'not sick in the last 30 days' are conditional on being sick.

Table 4: The Effect of TA+ on Time Use, Health and Educational Practices

Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

	Cover water vessel (1)	Treat drinking water (2)	Wash hands with soap after using toilet (3)	Talk to children about handwashing (4)	Help children with homework (5)	Remind children of homework (6)	Talk to teacher at school (7)	Consult with the nurse at health care center (8)
Participated (1=yes;0=no)	0.181***	0.011	0.136**	0.008	0.107**	0.118	0.039	0.142*
	(0.068)	(0.047)	(0.064)	(0.035)	(0.046)	(0.079)	(0.076)	(0.081)
F-statistic (of the first-stage)	271	271	271	271	233	238	231	271
Observations	385	385	385	385	344	343	343	385
R-squared	0.137	0.136	0.213	0.115	0.183	0.193	0.112	0.066

Notes: This table shows the results of a linear regression of the various woman-level health investment variables using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Note that questions (5), (6) and (7) were only asked if the woman had children currently enrolled in school. Additional baseline controls included are: age, number of children up to the age of 16 years, results of cognitive ability tests (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Table 5: The Effect of the TA+ on Child Educational Investments and Outcomes

Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

	Currently enrolled in school	No absence from school in last 7 days	Mother drops of child at school	Mother asks child about homework	Child spends at least 1 hour on homework daily	Mother helps with homework	Child receives any help with homework
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Participated (1=yes;0=no)	0.007	-0.063	-0.031*	0.189***	-0.106**	0.007	-0.005
	(0.028)	(0.052)	(0.018)	(0.054)	(0.050)	(0.009)	(0.026)
Child age (years)	0.004	-0.000	-0.004	-0.014	0.001	-0.001	0.011**
	(0.005)	(0.009)	(0.003)	(0.009)	(0.008)	(0.002)	(0.004)
Gender (1=female; 0=male)	0.274***	-0.280**	-0.039	-0.050	-0.252**	0.009	0.129**
	(0.081)	(0.134)	(0.042)	(0.139)	(0.127)	(0.029)	(0.064)
Gender * Age	-0.026***	0.024**	0.004	0.006	0.018	-0.001	-0.015***
	(0.007)	(0.011)	(0.004)	(0.012)	(0.011)	(0.002)	(0.006)
Birthorder child	-0.012	0.020	-0.005	0.003	-0.009	-0.007	0.001
	(0.010)	(0.018)	(0.007)	(0.020)	(0.018)	(0.005)	(0.008)
F-statistic (of the first stage)	604	535	535	535	535	535	535
Observations	722	674	674	674	674	674	674
R-squared	0.115	0.186	0.073	0.246	0.219	0.081	0.170

Notes: This table shows the results of a linear regression of the various child-level educational investment and outcome variables using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Columns (2) to (7) are conditional on the child being currently enrolled in school as per Column (1). Only children between the ages of 6 and 16 are included. Additional baseline controls included are: age, number of children up to the age of 16 years, results of cognitive ability tests (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Table 6: The Effect of TA+ on Child Health Investments and Outcomes

Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

	Not sick in the last 30 days (1)	Received treatment when sick (2)	Received treatment outside of the village (3)	Mother attended treatment (4)
Participated (1=yes;0=no)	0.043	0.034	-0.036	0.006
	(0.042)	(0.024)	(0.088)	(0.092)
Child age (years)	0.022***	0.003	0.006	-0.020**
	(0.005)	(0.002)	(0.008)	(0.008)
Gender (1=female; 0=male)	0.077	-0.016	-0.066	-0.028
	(0.056)	(0.024)	(0.082)	(0.081)
Gender * Age	-0.007	0.003	-0.000	0.012
	(0.006)	(0.002)	(0.009)	(0.010)
Birthorder child	-0.003	0.013*	0.005	-0.016
	(0.014)	(0.007)	(0.028)	(0.031)
F-statistic (of the first stage)	994	202	196	196
Observations	1,138	336	330	330
R-squared	0.093	0.119	0.209	0.161

Notes: This Table shows the results of a linear regression of the various child-level health investment and outcome variables using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Column (2) is conditional on the child reported to be sick in Column (1) and Columns (3) and (4) are conditional on the child receiving treatment in Column (2). Only children up to the age of 16 are included. Additional baseline controls included are: age, number of children up to the age of 16 years, results of cognitive ability tests (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates.*** p<0.01; ** p<0.5; * p<0.1.

Table 7: The Effect of TA+ on Women's Assets

Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

	Use vehicle (1)	Personal mobile (2)	Personal bank account (3)	Keep jewellery with yourself (4)	Use veil (5)
Participated (1=yes;0=no)	0.072	-0.030	0.062	0.006	-0.021
	(0.076)	(0.081)	(0.076)	(0.05)	(0.028)
F-statistic (of the first-stage)	271	271	271	271	271
Observations	385	385	385	385	385
R-squared	0.155	0.117	0.172	0.140	0.145

Notes: This table shows the results of a linear regression of the various woman-level asset variables and the use of the veil using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Additional baseline controls included are: age, number of children up to the age of 16 years, results of cognitive ability tests (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Table 8: The Effect of TA+ on Women's Decision-Making

Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

Is the woman the main decision-maker with regard to….

	What to cook on a daily basis?	What and how much to purchase at the local shop/market?	What and how much to purchase at the market outside the village?	What to do when your child falls ill?	Whether your child is enrolled in school a particular year?	Whether your child attends school a particular day?
	(1)	(2)	(3)	(4)	(5)	(6)
Participated (1=yes;0=no)	-0.029	0.016	-0.063	-0.005	0.000	0.114
	(0.081)	(0.080)	(0.078)	(0.080)	(0.079)	(0.081)
F-statistic (of the first-stage)	271	271	271	271	271	271
Observations	385	385	385	385	385	385
R-squared	0.145	0.170	0.163	0.113	0.086	0.102

Notes: This table shows the results of a linear regression of the various decision-making components using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Additional baseline controls included are: age, number of children up to the age of 16 years, results of cognitive ability tests (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Table 9: The Effect of TA+ on Women's Mobility

Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

Has the woman ever done activity X?

	Leaving the house	Going to a local shop/market (kirana)	Going to a market/shop outside of the village	Visiting a primary health care center	Visiting natal family	Making calls to the natal family	Joining any community groups (e.g. a Self Help group)	Going for mela/personal shopping/cinema (entertainment)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Participated (1=yes;0=no)	0.045	0.144*	0.089	-0.026	-0.021	-0.030	0.032	0.079
	(0.065)	(0.078)	(0.080)	-0.047	(0.025)	(0.041)	(0.045)	(0.075)
F-statistic (of the first-stage)	271	271	271	271	271	271	271	271
Observations	385	385	385	385	385	385	385	385
R-squared	0.131	0.191	0.164	0.131	0.091	0.109	0.177	0.112

Notes: This table shows the results of a linear regression of the woman's mobility using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Additional baseline controls included are: age, number of children up to the age of 16 years, results of cognitive ability tests (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Table 10: The Effect of TA+ Women's Need for Permission, Confidence and Knowledge

Linear and Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

	The women does not need permission to do the following activity (Conditional on having done this before)											
	Leaving the house	Going to a local shop/market (kirana)	Going to a market/ shop outside of the village	Visiting a primary health care center	Visiting natal family	Making calls to the natal family	Joining any community groups (e.g. a Self Help group)	Going for mela/personal shopping/cinema (entertainment)	Knowledge score (out of 12)	Knowledge score (factual) (out of 8)	Knowledge score (cognitive) (out of 4)	Confidence score (out of 36)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Participated (1=yes;0=no)	0.033	0.181*	0.039	0.080	0.008	0.213***	-0.043	0.023	2.829***	2.317***	0.512***	2.156***
	(0.071)	(0.099)	(0.114)	(0.072)	(0.048)	(0.069)	(0.295)	(0.073)	(0.394)	(0.307)	(0.150)	(0.763)
F-statistic (of the first-stage)	203	143	118	220	267	272	10	191	356	356	356	384
Observations	315	233	201	347	376	357	34	263	274	274	274	270
R-squared	0.125	0.163	0.184	0.106	0.069	0.178	0.765	0.154	0.356	0.368	0.204	0.210

Notes: This table shows the results of a linear regression of the remaining woman's mobility indicators, confidence and knowledge variables using the invitation to participate as an instrument for the participation status. Columns (1) through (8) are conditional on having done this activity before (note that in Column (7) only 34 women reported to have done this activity - these results need to be interpreted carefully). Additional baseline controls included are: age, number of children up to the age of 16 years, results of cognitive ability tests (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Table 11: The Effect of TA+ on the Bargaining Game

Linear and Linear Probability Model Instrumental Variable Regressions with the following dependent variables:

	Rs spend on water tablets by woman	Rs spend on water tables by husband	Absolute difference between (1) and (2)	λ	Dummy variable if λ=1	Woman speaks first in negotiation	Woman speaks last in negotiation	First speaker suggest decider	First speaker inquires about preferences of other	First speaker dictates division	Woman has heard about water tablets	Husband has heard about water tablets
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Participated (1=yes;0=no)	-1.242	-1.338	-1.826	0.083	0.080	-0.011	0.109	-0.004	0.224*	-0.220*	0.023	0.163
	(1.591)	(1.405)	(1.235)	(0.128)	(0.134)	(0.130)	(0.135)	(0.076)	(0.123)	(0.128)	(0.071)	(0.116)
F-statistic (of the first-stage)	68	68	68	58	58	68	68	68	68	68	68	68
Observations	181	181	181	113	113	181	181	181	181	181	181	181
R-squared	0.193	0.272	0.161	0.328	0.321	0.198	0.127	0.077	0.192	0.196	0.242	0.178

Notes: This table shows the results of a linear regression of the various bargaining variables using the invitation to participate as an instrument for the participation status. Additional baseline controls included are: age, number of children up to the age of 16 years, results of cognitive ability tests (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Appendix Table 1: The Effect of the TA+ on Child Test Scores

Linear Model Instrumental Variable Regressions with the following dependent variables:

	Letters per minute	Syllables per minute	Words per minute	Non words per minute	Words per minute - Grade 1 level	Words per minute - Grade 2 level
Participated (1=yes;0=no)	1.697	-4.314	-2.446	-1.505	-2.910	-3.759
	(5.412)	(5.737)	(4.757)	(3.076)	(7.002)	(6.246)
Child age (years)	5.467**	3.221	3.969*	2.560	6.356*	4.920*
	(2.356)	(2.587)	(2.305)	(1.645)	(3.365)	(2.768)
Gender (1=female; 0=male)	34.459	11.375	27.233	15.988	38.570	23.693
	(22.687)	(23.739)	(20.393)	(15.020)	(29.079)	(25.961)
Gender * Age	-5.232*	-1.811	-4.168	-2.407	-5.968	-3.827
	(3.073)	(3.218)	(2.774)	(2.052)	(3.966)	(3.556)
Birthorder child	-4.829***	-2.849	-2.684*	-1.331	-2.492	-2.696
	(1.622)	(1.734)	(1.404)	(0.925)	(2.092)	(1.845)
Observations	172	172	172	172	172	172
R-squared	0.404	0.419	0.424	0.401	0.421	0.408

Notes: This table shows the results of a linear regression of the results of literacy and numeracy tests of a randomly selected child between the ages of 6 and 10 years using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Additional baseline controls included are: mother's age, number of children (of the mother) in the household up to the age of 16 years, results of cognitive ability tests of the mother (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Appendix Table 1: The Effect of the TA+ on Child Test Scores - continue

Linear Model Instrumental Variable Regressions with the following dependent variables:

	Counting objects (out of 3)	Number identification - one digit (out of 10)	Number identification - two digits (out of 10)	Count objects - circle a number (out of 2)	Count objects - write number (out of 2)	Find the missing number (out of 2)	Addition problems (out of 4)	Subtraction problems (out of 2)
Participated (1=yes;0=no)	0.087	0.794	1.050	0.010	0.321	0.258	0.192	0.176
	(0.149)	(0.941)	(0.885)	(0.197)	(0.217)	(0.224)	(0.388)	(0.164)
Child age (years)	0.095	0.637	0.885**	0.086	0.083	0.153	0.521***	0.213**
	(0.091)	(0.437)	(0.376)	(0.092)	(0.088)	(0.089)	(0.174)	(0.086)
Gender (1=female; 0=male)	0.262	-0.422	1.680	-0.180	0.012	0.339	2.125	0.612
	(0.819)	(4.850)	(3.931)	(0.997)	(0.969)	(1.040)	(1.815)	(0.784)
Gender * Age	-0.025	0.014	-0.414	0.010	-0.039	-0.096	-0.359	-0.125
	(0.112)	(0.645)	(0.531)	(0.133)	(0.130)	(0.140)	(0.246)	(0.108)
Birthorder child	-0.079	-0.358	-0.567**	-0.034	-0.104	-0.075	-0.236*	-0.039
	(0.056)	(0.318)	(0.275)	(0.066)	(0.068)	(0.066)	(0.121)	(0.056)
Observations	172	172	172	172	172	172	172	172
R-squared	0.179	0.156	0.350	0.149	0.236	0.274	0.359	0.359

Notes: This table shows the results of a linear regression of the results of literacy and numeracy tests of a randomly selected child between the ages of 6 and 10 years using the invitation to participate in the Tara Akshar Literacy and Numeracy Program as the instrument for participation status. Additional baseline controls included are: mother's age, number of children (of the mother) in the household up to the age of 16 years, results of cognitive ability tests of the mother (FDS and RAN), land acreage owned by the household, number of household members, number of adult household members, and whether or not the house has electricity. Includes caste-fixed effects and strata-fixed effects. Robust standard errors are reported under the coefficient estimates. *** p<0.01; ** p<0.5; * p<0.1.

Appendix Table 2: Distribution of Nash Bargaining Weight - λ

	Percentage of couples
Less than 0	10
0	41
Between 0 and 1	2
1	18
More than 1	4
Same preferences	23

Notes: This table presents the distribution of the bargaining weight computed from the spousal bargainig game as per formula: (tab_joint-tab_hus)/(tab_learner-tab_hus) N=181

Appendix Table 3: Descriptive Statistics of the Bargaining Game

	Variable	Obs	Mean	St.Dev.
(1)	Rs spend on water tablets by woman	183	6.57	5.64
(2)	Rs spend on water tables by husband	183	6.07	5.83
(3)	Absolute difference between (1) and (2)	183	4.16	4.34
(4)	Gamma (Decision-making weight of the woman)	114	0.31	0.45
(5)	Woman speaks first in negotiation	183	0.41	0.49
(6)	Woman speaks last in negotiation	183	0.33	0.47
(7)	First speaker suggest decider	183	0.10	0.31
(8)	First speaker dictates division	183	0.31	0.46
(9)	First speaker inquires about preferences of other	183	0.59	0.49
(10)	Woman has heard about water tablets	183	0.08	0.27
(11)	Husband has heard about water tablets	183	0.21	0.41