Poverty Graduation Programs: Psychological Implications and Sources of Heterogeneous Impacts

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Contents

List of Figures

List of Tables

Abstract

Poverty Graduation Programs: Psychological Implications and Sources of Heterogeneous Impacts

Poverty graduation programs in low-income countries provide an integrated package of interventions to poor rural households. The program traditionally includes the transfer of a productive asset, training on agricultural technologies and/or business administration, and building beneficiary self-confidence and other psychological assets through soft-skills or coaching interventions. Multiple studies have found participants to benefit substantially from the program and positive effects have been shown to sustain for several years after the end of the program. Nevertheless, there are two pressing questions that are still to be answered regarding the functioning of the program. First, it is not clear why these programs work. Its multifaceted nature presents a challenge to understanding which are the necessary components for it to be cost-effective. Second, there is evidence that the program effects are highly heterogeneous, and some participants do not benefit much from participating. Understanding the possible causes of the differentiated effects is important to design better interventions. This dissertation is an attempt to contribute to the answering of these questions.

A central component of graduation programs is the life-skills coaching module. This is an expensive component that both program implementers and participants have claimed to play a central role in the success of these programs. Nevertheless, there have been few attempts to understand its role in the success of the intervention. In Chapter 1, I analyze how including a life-skills coaching module to *Haku Wiñay*, a program in Peru that had all of the other components of the graduation intervention but this one, affects a series of psychological variables. I find evidence that the additional program increases the belief of having control over the outcomes of events that affect participant's lives. At the same time, the evaluation reveals that individuals with initial levels of psychological assets above the median increase their annual income as a consequence of the whole program.

The two results of this chapter may indicate that income could be positively affected through an increase in locus of control. The next round of data collection will allow to test this hypothesis.

Chapter 2 stems from the results of Chapter 1 that reveal that participants that come into the program better psychologically equipped outperform those that start the program less equipped, and from the evidence from other studies highlighting the heterogeneity of impacts of graduation programs. In this chapter, with the aid of simulations generated by an infinite horizon model parametrized to mimic a rural economy where households may be stuck in a low equilibrium, I characterize the importance of two possible sources of heterogeneity — covariate shocks and initial psychological assets — in the impacts of a graduation program that transfers both physical and psychological assets. This simulation analysis suggests that a possible avenue for having graduation programs that generate benefits for a larger portion of the participants is by expanding pre-intervention activities to include an assessment of psychological well-being status. By doing this, the program may shift some of the psychological asset-building activities, such as the coaching component, from those that are well endowed towards those lacking these assets. At the same time, expanding the program towards insurance literacy and the offering of such products may be beneficial. Additionally, some of the program funds destined to each household may go directly towards insurance in order reduce the possibility of falling to a low equilibrium, reducing the probabilities of benefiting from the program in the face of a shock.

Lastly, Chapter 3 looks at whether the coaching program embedded in the *Haku Wiñay* intervention generates differentiated effects for female-headed households compared to male-headed households when considering the psychological variables and a series of agricultural practices. This chapter is based on the same data from Chapter 1, and continues to explore possible sources of heterogeneous impacts. The chapter shows that female household heads have pre-treatment psychological variables that are lower compared to those of male household heads, which may make them more receptive to the coaching

component in particular since the intervention was modestly fine-tuned to speak to the needs of women. I show that certain psychological variables for female household heads do increase relative to the male household heads, although the differences are not statistically significant. I additionally find that female-headed households are more likely to grow vegetables, prepare and use organic fertilizer, and cultivate pastures as a consequence of participating in the coaching program relative to male-headed households, although the effect is only significant for the first variable, and marginally significant for the second. Nevertheless, given the small number of women that are household heads, the significance tests for the effects on this subgroup are underpowered.

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Chapter 1

The Impact of Psychological Asset Building on the Effectiveness of Peru's *Haku Wiñay*

Juan Sebastian Correa

Poverty graduation programs are aimed at giving a big push out of poverty to rural households on very vulnerable economic conditions. These programs are regarded as a success since short and even long term impacts have been observed on economic well-being indicators of participating households. One of the usual components of these programs is an explicit life skills coaching module. Anecdotal evidence points towards a very important role of this module on the success of the program. But to our knowledge, there is no clear evidence in the literature identifying the psychological mechanisms through which it operates. The *Haku Wiñay* program in Peru follows almost the "classic formula" of graduation interventions, except for the life skills coaching. This provides a unique opportunity to understand how the coaching module works by offering an ancillary coaching intervention to a subgroup of the *Haku Wiñay* participants of the 2017 cohort. Participants of the additional program are found to increase the value of an index measuring their internal locus of control — the belief of having control over the outcomes of events that affect their

lives — by a third of a standard deviation relative to non-participants while no significant effect is found for a measure reflecting hope. *Haku Wiñay* beneficiaries with initial levels of locus of control above the median have an impact on annual income of the program that is more than three times larger than for those with initial levels below the median. These results suggest that the ancillary coaching intervention may have the potential to positively affect economic well-being through an increase in locus of control.

1.1 Introduction

Multifaceted graduation programs have been shown to be an effective approach to generate lasting improvements in the well-being of rural people in poverty (Banerjee et al. (2015), Banerjee et al. (2016), Bandiera et al. (2017)). Although its components usually vary across contexts, the program traditionally includes the transfer of a productive asset, training on agricultural technologies and/or business administration, and building beneficiary self-confidence and other psychological assets through soft-skills or coaching interventions. While the reduced form impacts are impressive, and there is a theoretical case for strong complementarities between the transfer of tangible and psychological assets (Barrett et al. (2018)), exactly how and why graduation programs work is incompletely understood. Reported heterogeneous responses to the intervention (Bandiera et al. 2017) add complexity to the understanding of the graduation programs, but it only makes it more critical to comprehend the mechanisms through which it operates in order to design programs that reach all ultra-poor households.

Peru's on-going *Haku Wiñay* [1] program, which provides all of the elements of the BRAC-based graduation model except the psychological asset building, provides an important opportunity to quantify the relevance of the psychological attributes on the program's success by allowing to measure how much additional impact can an extra coaching and psychological asset building module add to a poverty reduction program. Program implementers have emphasized the importance of the coaching component in the positive results of the multifaceted intervention, arguing that it has been consistently considered by local implementers and by the participants themselves as probably the most crucial element for the success of Graduation-type programs (de Montesquiou et al. (2018)). The highlighting of this module as central for the success of the program points in the direction of the importance of having optimal psychological attributes. Nevertheless, beyond the anecdotal evidence, there hasn't been an analysis that quantifies the relevance of the coaching component nor provides a clear picture of the mechanism through which it operates.

[1] *Haku Wiñay* means "Let us Grow" in Quechua

This paper aims at answering two main questions. First, we want to carefully identify the mechanisms that explain why these additional interventions work. For this goal, we seek to provide evidence to whether two key psychological concepts — locus of control and hope — are relevant to the success of graduation type interventions. Locus of control is the degree to which people believe that they have control over the events that affect their lives — internal locus of control —, as opposed to external forces — external locus of control — (Rotter (1966)). We define hope as *aspirational* hope in the sense that it motivates action aimed at an aspiration (Lybbert and Wydick (2018b)). There is mounting evidence that poverty undercuts both cognitive and non-cognitive skills (Mullainathan 2013, Haushofer and Fehr 2014, Wuepper and Lybbert 2017). Both locus of control and hope fall into the latter category. Others have speculated that graduation programs work because they reverse these negative effects of poverty by raising subjective mental capacities (Duflo (2012)). We are not aware of previous efforts in the context of graduation programs to measure these psychological variables, and our goal is to not only implement the ancillary interventions that should reverse these negative consequences of poverty, but also to measure psychological attributes so that information can be used to design even more effective programs in the future. Second, we want to test whether higher initial levels of the two aforementioned variables generate increased impacts of the program on our main measure of economic well-being, which is annual income. There is increasing evidence of the relevance of these factors in economic decision-making (Abay et al. (2017), Lybbert and Wydick (2018b)), turning them into a source of potential heterogeneous responses to poverty alleviation interventions. If we are able to show that i) the ancillary program has a positive effect on the psychological variables and ii) income is higher for households with higher levels of locus of control and/or hope, there is indicative evidence for the mechanism through which coaching operates to increase income in graduation-type interventions.

To answer these questions, we use the 2017 cohort of the *Haku Wiñay* (HW) program in Peru, that as described above, does not include a coaching module. We exploit the discontinuity in the eligibility criteria for villages to be considered for the HW program

to identify the effect of the programs. Our sample initially consisted of 53 villages, 29 that satisfied the eligibility criteria and 24 that didn't and 999 households. Among the eligible villages for HW, we employ a partial population design where we randomize villages into being either not treated by the ancillary intervention or partially treated (ancillary intervention not offered to everyone in the village). This allows us to capture spillover effects from the ancillary treated households to non-treated households in the same village. We use a regression discontinuity approach to estimate the intention-to-treat effects of the interventions on our post-treatment survey. This allows us to capture differences between households only exposed to HW and those that were exposed to both HW and coaching (directly or indirectly). We further analyze the existence of heterogeneous effects of psychological variables on annual household income level using the same estimation strategy.

We find that belonging to a HW eligible village increases income by around 1400 Soles (USD 800 in 2017 PPP). Moreover, we are able to show that households with an initial level of locus of control above the median as measured by the baseline, have on average an impact of HW on income of about 1200-1600 Soles (USD 700-900 USD in 2017 PPP) higher than those with initial locus of control levels below the median. For this subgroup with initial locus of control above the median, the impact of HW is more than 40% higher than the income of those that belong to the same subgroup but belong to villages not eligible for treatment. We are also able to show that the coaching intervention increases both the locus of control and hope measures, although the difference for the latter with those that only receive the main intervention is not significant. We also find some evidence that coaching makes participants adopt agricultural practices that are readily available for them through the HW intervention.

These results provide indicative evidence favoring the hypothesis that coaching has the potential to have an effect on economic well-being through an increase in locus of control. We are not able to verify this directly since the coaching intervention ended very close to the date of our second and most recent data collection. Nevertheless, the results are

promising and provide robust evidence favoring the potential coaching has in magnifying the effects of a program like HW. In the second quarter of 2021 we expect to run a new survey that will allow us to confirm these findings.

The rest of the paper is organized as follows: section 2 will expand on the literature of non-cognitive skills and targeted interventions. Section 3 will explain carefully the psychological instruments that are being used and how are they measured. Section 4 presents the research design in detail, explaining the programs and data we collected. Section 5 shows the estimation strategy. Section 6 presents the results. Section 7 concludes.

1.2 Non-cognitive skills and targeted interventions

Locus of control, hope, and non-cognitive skills in general have been studied in a variety of economic analysis for the last 20 years. An important percentage of the research centers on these measurements as explanatory variables, seeking to explain schooling choices (Heckman et al. 2006; Coleman and DeLeire 2003), labor markets outcomes (Heineck and Anger (2010); Caliendo et al. (2015)), savings decisions (Cobb-Clark et al. 2016), among other outcomes. Most of this literature focuses on developed countries where these types of questionnaires have been used and validated more extensively. More recently, the literature has started to use these measures, locus of control in particular, in developing contexts to measure technology adoption (Malacarne 2019;Abay et al. 2017;Wuepper et al. 2020) and savings behaviors (Abay et al. 2016).

Another strand of empirical literature more closely related to this paper deals with analyzing how targeted programs can affect non-cognitive skills, and the effect this has on economic behavior. Again, there is a substantial quantity of research in this area that studies WEIRD[2] populations. The focus on non-WEIRD populations is more recent but increasingly rich. For instance, Bernard et al. (2014) and Krishnan and Krutikova (2013) find that targeted interventions increase measured levels of locus of control and self-efficacy, a concept closely related to locus of control, and other non-cognitive skills. The former also finds evidence of positive effects in savings behavior in the short run

[2]Western, educated, industrialized, rich and democratic (WEIRD)

for a sample in rural Ethiopia while the latter shows better early labor market outcomes for a young population in Bombay. Lybbert and Wydick (2018a) find increased levels of hope among a sample of indigenous women in Mexico that were exposed to a light-touch intervention targeting aspirations, and at the same time, find modest positive effects on enterprise revenues and profits for participants of the program. In a similar spirit, Baranov et al. (2020) show that a brief light-touch intervention in a population coming from an informal urban settlement in Kenya aimed at promoting gratitude, self-affirmation, and aspirations succeeds at increasing a gratitude index, but fails to have effects on decision making. The scant and mixed evidence of behavioral responses to these targeted programs give space for holistic approaches to be further evaluated and analyzed in order to understand the main drivers of the observed economic impacts.

These programs aiming at bettering non-cognitive skills vary widely in duration and approach which makes it hard to draw clear-cut conclusions about their efficacy, especially for the interest of this paper since little has been studied of their effect in the context of graduation programs. The only analysis of the relevance of such programs in graduation contexts that we are aware of is the one by Sedlmayr et al. (2020). The authors find some indication that a coaching intervention complements other transfers, perhaps bolstering investment in productive assets and, more strongly, promoting positive psychological attributes. Nevertheless, their design doesn't allow to clearly isolate the effect of coaching.

Overall, coaching interventions of the sort incorporated into graduation programs are intended to generate and strengthen a battery of non-cognitive skills, including the motivation and ability of a person to design and carry out plans, and to adaptively learn and problem solve. These interventions are substantially longer than the light-touch targeted interventions mentioned earlier and incorporate a strong "hand-holding" component, since implementers consistently state that individualized attention is crucial for the success of the program (de Montesquiou et al. 2018). From this perspective, coaching can be seen to develop what might be termed attitudinal assets that, akin to other assets, permit

individuals to realize improved standards of living. Carter (2016), Lybbert and Wydick (2018b) and Malacarne (2019) develop theoretical models that incorporate how psychological assets may affect economic decision-making. A simple way to think about it is to consider these attitudinal assets as a type of total factor productivity in a simple production function of the type $y = \alpha f(k)$. $f(k)$ is the production function that depends only on capital and α is the "attitudinal total factor productivity". This way of thinking about the problem implies that even if a given household knows precisely how to turn k into y, what ends up mattering is what they *believe* they can do with k to turn it into y. These assets would determine what a given household beliefs can achieve and guide its decisions[3].

Besides the theoretical case for focusing on the importance of these assets, the choice of measuring particularly locus of control and hope is empirically justified by the strong evidence of even short and impersonal interventions having effects on these variables. In the following section we expand on both these concepts.

1.3 Psychological instruments: Locus of Control and Hope

1.3.1 Locus of Control

The locus of control measures the degree to which people believe they can control the events that affect their lives. It differentiates between an external locus of control and an internal one. According to Rotter (1966), having an external locus control means that the individual believes that the successes or failures in her life are controlled by external forces that she cannot control. On the other hand, an individual is said to have an internal locus of control if she considers that she has control over the outcomes of events in her life. To measure this concept, we used the Levenson (1981) I-P-C (internality-chance-powerful others) scale, which is commonly used in the literature. This scale measures one index for each internality, chance and powerful others. The internality scale measures the extent

[3]As in Lybbert and Wydick (2018b), we focus on underperceptions of α, while for the context of the study, overperceptions may be less relevant. If $\alpha = \gamma\phi$, where ϕ is the true productivity, our analysis concerns situations in which $\gamma < 1$

to which people believe they can control their own lives. Contrary to internality, the chance scale measures the perception of chance being in control of your life. The powerful others scale measures the belief that life is predictable essentially because it is dominated by powerful third parties (leaders local, government, some god, etc). The chance and powerful others scale aim at understanding the forces at play behind the beliefs of a person with an external locus of control.

To build each index, respondents have to answer whether they agree or not with a question and to what extent. Examples of questions included are: for internality, "when you make plans, are you almost certain that you can make them work?" For chance, "when you're doing well in life, is it because you're being lucky?" For powerful others, " Is what happens in your life determined by powerful people?". Higher values of both chance and powerful others imply a more external locus of control. We chose not to reduce the dimensionality of these indices because we wanted to understand precisely which type of external locus (chance and powerful others) an intervention as the one we propose ends up affecting, if any. We standardize each scale to give them mean zero and unit variance to provide a more comparable interpretation for impacts. Appendix 1.A shows the complete questionnaire that was asked. We eliminated 2 questions of each scale because they were not appropriate for the context for a total of 6 questions per scale. We adjusted the language so that they were more understandable for the context of rural Peru. We adjust the answers for the presence of acquiescence bias following Rammstedt et al. (2013) given the challenges that measuring non-cognitive skills brings in rural contexts (Macours and Laajaj (2020)).

Stability of the locus of control — Locus of control was initially proposed as a relatively stable personality trait. On the other hand, there's been a general consensus on the malleability of domain-specific locus of control. There's a plethora of evidence that shows how this locus of control responds to different interventions (panic attacks (Katerndahl 1991), memory loss (Hastings and West 2009), driving (Huang and Ford 2012)). Nevertheless, there are strands of the literature that have provided evidence that the general concept is also prone to change (Menec et al. (1994), Cobb-Clark and Schurer (2011), Nowicki et al.

(2018)) both through time and as a cause of targeted interventions. Since most of this evidence comes from the global north, the knowledge about these concepts is scarce for non-WEIRD populations. Hence, it remains an open question to understand how these measurements behave in rural environments in the global south.

1.3.2 Hope

Our measure of hope comes from Lybbert and Wydick (2018a). This measure of hope is *aspirational*, in the sense that the individual actively seeks positive changes, and the envisioning of being able to achieve such changes comes from a strong sense of agency. The measure is made up of 3 separate indices that we combine into one: aspirations, agency and pathways. Agency or self-efficacy, is the belief of being able to achieve specific goals, and pathways refers to the individual's ability to seek solutions to the problems that they may face when they want to meet a certain goal. To measure aspirations we ask questions such as: "Is it better to learn to accept reality than to dream about the future?" Or, "Is it better to have aspirations and dreams for your family than to accept each day as it comes?" For agency or self-efficacy, "Can you think of several ways to solve a problem that arises in your farm?". An for pathways an example of a question is "if the sales of your farm are low, do you know how to find other buyers?" Participants answer the same way as they answer the locus of control questions. First the say whether they agree or disagree, and then to what extent. The possible answers are: totally disagree, disagree, agree, or totally agree. In order to reduce the dimensionality, we create a unique index from these three measure that and summarize this reduce measure as hope, following Lybbert and Wydick (2018a). We follow Anderson (2008) on his approach to create a summary index from a set of multiple outcomes. This measure is also standardized. Higher values of the index indicate higher hope levels. Appendix 1.A shows the complete questionnaire we used to build this measure.

1.4 Research Design

1.4.1 *Haku Wiñay*

Haku Wiñay is a three year program designed and implemented by the Ministry of Development and Social Inclusion (MIDIS in Spanish) of Peru that targets subsistence farmers whose household head is between the ages of 18 and 65. It started as a pilot in 2012 and it was expanded the next year to a governmental program as part of the governmental strategy of development and social inclusion policies called "Include to Grow" (MIDIS (2012)). Initially, the program was designed to give the beneficiaries of *Juntos* — Peru's main CCT program — sufficient tools for them to insert themselves on a robust growth path and not depend solely on the transfer. As stated by FONCODES, the dependency within MIDIS in charge of implementing HW, the motivation behind HW is that low-income rural households should have the sufficient capabilities to allow them higher levels of productivity and diversification of activities. HW aims at solving this problem as it is a capacity-building program that focuses on increasing the autonomous income of households so that they can *graduate* from poverty. From 2012 to 2018, more than 230,000 people have participated in the program with a cost close to USD 600,000,000 (2017 PPP)[4].

The program has two different main components: "Product 1" and "Product 2" (FONCODES (2016)). Product 1 consists of delivering training and assets related to agricultural technologies and of the improvement of housing conditions. The transferred assets usually include animals such as chickens or guinea pigs, materials to build sheds for these animals, improved seeds, and where water is available, infrastructure for irrigation. It is important to note that not everybody receives the same package. The program uses a needs-based approach, encouraging participants to demand transfers that suit their interests and needs and in congruence with their surrounding environment.

A member of the community is in charge of the technological training. This person is called a *Yachachiq* and she pays bi-monthly visits to each household during the first

[4]All USD values will be expressed in 2017 purchase power parity

10 months, monthly visits in the subsequent year, and sporadic visits in the last year of the program. The *Yachachiq* is usually selected because of her farming skills and knowledge, and is responsible for visiting around 30 to 40 households. The *Yachachiq* offers training to household members in how to prepare organic fertilizers, in pasture and forage management, in how to build a vegetable garden and in how to raise small animals (chickens and guinea pigs in particular). The latter two are usually aimed at the adult female of the household, since women are traditionally in charge of gardening and of taking care of small animals. Most of the asset transfers and training happen during the first year of the intervention. The program also builds a new kitchen in case the old one is inside the household and provide guidelines on the adequate distribution of physical environments and solid waste disposal. All participating households receive "Product 1". "Product 2" consists of financing business ideas of groups formed by households that are successful at winning a contest. These groups consist of 3 to 4 households that get together and design a business plan with the guidance of a *Yachachiq*. The business ideas are then presented in a fair where local leaders and other members of the project vote to choose which projects are the most viable. 40% of the amount delivered must be invested in technological and commercial assistance, while the rest must be dedicated to the acquisition of goods or supplies. Around 40% of HW participants participated in the contest, and about half of those participants won. Overall, the cost of the implementation per household was around 4600 Soles (USD 2640).

1.4.1.1 Target population

Treatment is offered at a village level. FONCODES defines the characteristics that have to be met by individual villages in order to become eligible. A list of all the villages that meet their criteria is then sent to the regional authorities for them to choose the villages to intervene.

In 2017, our cohort of study, the eligible villages were made up of those that belonged to districts[5] in the border (usually, districts characterized by being in the Amazon) and by those that met the following requirements:

[5]Districts are the immediately higher administrative division.

1. Villages characterized by subsistence agriculture according to the 2012 agricultural census. This implies that the average size of the agricultural unit[6] in these villages has to be less than the median for all the villages in the agricultural census.

2. Villages belonging to districts with a poverty rate higher than 40% or to districts prioritized for the implementation of the reduction of chronic child malnutrition.

3. Villages with at least 40 households.

4. Villages where at least 60 % of the households have at least one NBI [7] (unmet basic need).

1.4.2 Coaching intervention

The coaching program is a 9 month program that aims at helping participants achieve typically a productive goal chosen by themselves. The program was designed by social workers and social-psychologists at the Institute of Peruvian Studies (IEP) that had previous experience on this topic and that used as inspiration the structure of similar programs. The program has two main objectives. First, it aims at fostering of self-awareness and the recognition of the surrounding environmental conditions so that each person can fully grasp how they perceive themselves and in which context they are situated. The coaching takes place while the core of HW is being developed or it is closed to being finished. This is a key element of the potential success of this ancillary intervention since it aims at putting into perspective the new possibilities that become available because of the trainings and transfers that the beneficiaries have had access to. Second, participants are encouraged to develop a plan to achieve a goal to accomplish on a set time frame. The idea is that the first component facilitates the fulfillment of the second one. Beyond the immediate scope of the ancillary intervention, the experience of the coaching should help beneficiaries build

[6] An agricultural unit is defined as the plot or group of plots used totally or partially for agricultural production, including livestock, by an agricultural producer, irrespective of the size, tenure regime or legal situation. (INEI (2012))

[7] The NBI is an index proposed by ECLAC widely used in Latin America to identify critical deficiencies on a given population in order to characterize poverty. In Peru, the index is build according to the following indicators. 1) Households with inadequate physical characteristics. 2) Households with overcrowding. 3) Households without any kind of drainage. 4) Households with children that do not go to school. 5) Households with high economic dependence.

up psychological assets that may aid in the achievement of productive goals. Because of this reason, it mostly targets the person in the household that participates the most in HW. At the same time it is also designed to actively involve the spouse and other family members.

The program was implement by staff trained by the program designers. It is worth noting that the trainers are not certified coaches, but usually people with previous experience in technical assistance programs with knowledge of the context and economic conditions of the beneficiaries of the program. In order to not confuse HW participants, the coaches were never current *Yachachiqs*. They did not identify as HW staffers so that the participants were aware that they were not bringing any additional materials or assets for them. The coaching sessions were individual and would usually last about 2 hours. There were 18 sessions in total, with a session taking place every two weeks and sometimes weekly.

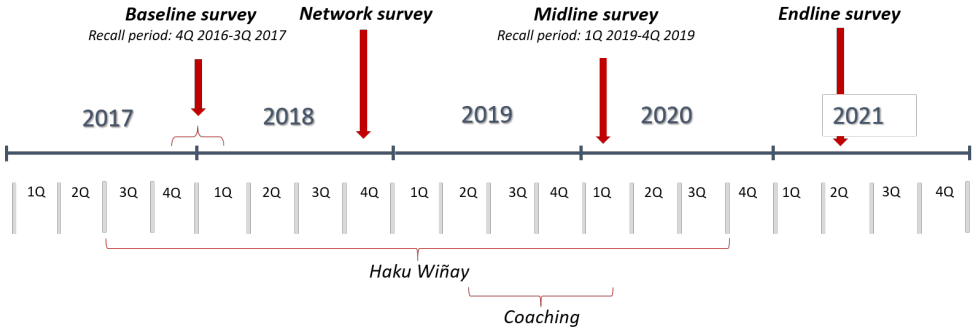
This coaching module was divided in two phases. The first phase which lasts two months is mostly focused on setting up an achievable goal and on recognizing the ways to reach it. In the sessions of the second phase, the coach monitors the steps and actions the participant is taking to achieve her goal. It focuses on overcoming the struggles and barriers the participant may be encountering on her path to reach her goal. By doing this, the coach also works on the development of non-cognitive skills that help fulfill the participant's plan. It is important to notice that this intervention gave no additional resources to the participants for them to use towards the goal completion. Appendix 1.B shows a table with the type of goals the participants set for themselves and the titles of of the sessions that were part of the program. The guide that was used by the coaches is available from the author upon request.

1.4.3 Timing of the interventions and surveys.

Up until now, we've gathered three rounds of surveys for this project. A baseline in late 2017-early 2018, a second survey in October 2018 where we gathered information on participants networks, and a midline survey in early 2020. Figure 1.1 shows a timeline with the dates of the surveys and the start and span of the interventions. As mentioned

earlier, the core of the asset transfers and training occur during the first year, so at least one full agricultural cycle has passed under the influence of the intervention. This allows us to capture changes in income in the midline survey. The coaching intervention finished just before the midline survey. Because of this, we are not able to capture the effect of this ancillary intervention on income. We expect to be able to capture this effect when we run the endline survey in the second quarter of 2021. By then, a full agricultural cycle would have gone by after the end of the coaching intervention.

Figure 1.1: Timeline of interventions and surveys



1.4.4 Methodology

We imposed a series of restriction to the villages that satisfied the criteria outline in Section 1.4.1.1 in order to get our sample. We did this in three stages. First, we kept only the villages that had a high presence of *Juntos* (the CCT program) population. We imposed this restriction since most graduation-type programs also have a cash transfer component. As mentioned in Section 1.4.1, HW started as a program targeting *Juntos* but now this is no longer a requirement. Villages in 5 departments satisfied this criteria: Ayacucho, Cajamarca, Cusco, Huánuco and Ancash. In the second stage, we kept villages that belonged to districts where at least one village selected to be intervened had 60% to 70% of their population with at least one NBI, and at least one village with 50% to 60% their population with at least one NBI. Our identification strategy rests on the discontinuous jump in the probability of being selected into treatment at the 60% NBI threshold. Hence, we chose a window small enough so that the villages were comparable but wide enough to be able to have the statistical power to identify the potential effects

of the program. As we will show in the following sections, we are able to show that the sufficient conditions for a consistent identification of the program effect hold for our chosen window and sample. After this second stage we ended up with 28 villages to the left of the threshold and 40 villages to the right. Of these 40 villages, only 28 had been selected by HW for intervention. In the third stage, in order to increase the proportion of villages selected for treatment, we eliminated the ones the we were able to prove that due to their characteristics had had a low probability of being chosen. These were villages that according to the local authorities that were in charge of the program implementation, would not get selected because they were too far away from the rest of eligible villages. This is a valid criteria for exclusion since HW operates in places where they can gather at least 400 participants in relatively close proximity. This usually involves grouping multiple villages together under the umbrella of a unique committee (*Nucleo Ejecutor Central*) that is in charge of implementing and overlooking the program. 7 villages in total exit the pool this way: 1 village to the left of the threshold, 2 selected villages to the right and 4 unselected villages to the right [8]. Additionally, two other districts were excluded. The first one because it had a high proportion of unselected villages to the right of the threshold (6 out of 8) and the second one because in the calls made to this region it was reported that no village in this district had been selected by the program.

After this last stage, 24 villages remained in the study that were to the left of the threshold and 29 villages to the right. The villages to the left are the control group and those to the right are intention-to-treat (ITT) group. 26 out of the 29 in the ITT group were villages selected to be intervened by HW. Based on information provided by the local authorities, we thought initially that only one village of the control group would end up being selected for treatment. This would have implied that the percentage of households intervened in the control group would have been around 5%. However, through the surveys we found out that the number of villages selected for treatment in the control group was higher.

[8] Using information from the National Institute of Statistics and Informatics (INEI in Spanish), we constructed maps of the districts included in the study. Based on these maps and the distance information obtained through calls to the regions we obtained the travel time between each village and the HW-eligible villages in their same district. We excluded the 7 villages for which the travel time to the closest eligible village was greater than 1 hour and 45 minutes.

The percentage of households intervened by the program is 24% in the control group and 72% in the group ITT. Figure 1.2 shows a diagram with the initial distribution of villages over the NBI score variable. Each marker on the diagram represents a village.

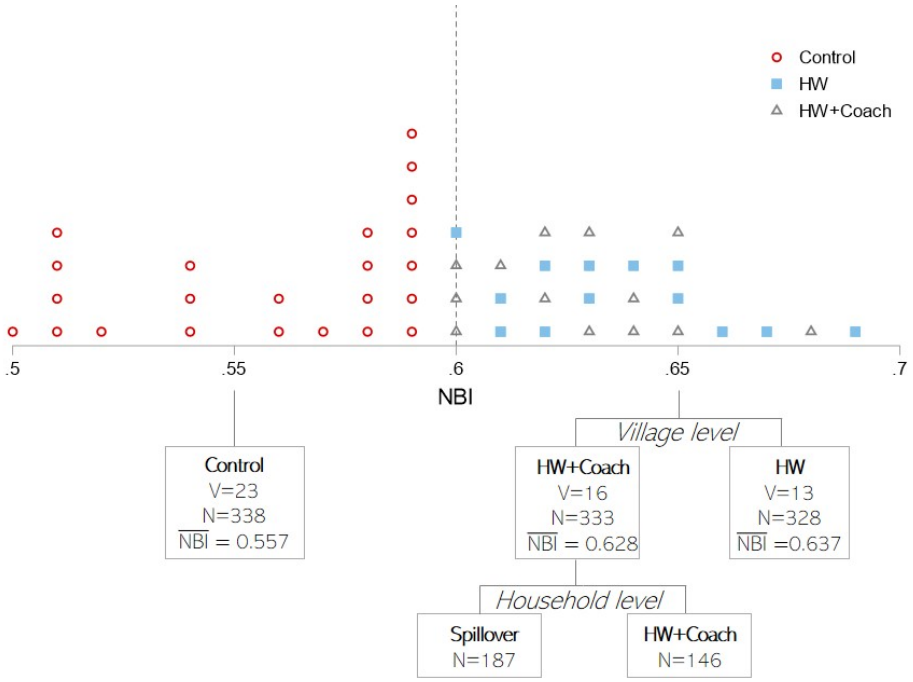
We further selected a random sample of villages initially assigned to HW that did indeed receive the program for the additional coaching intervention. Following Baird et al. (2018) we implemented a partial population design in which we offered coaching in 16 of the 26 villages where HW was actually implemented. The other 10 only received HW. Our objective is to estimate not only the direct effects of coaching but also the possible spillover effects of those treated by coaching towards those who did not receive this treatment. A randomization at the village level where in the selected village the treatment is offered to the entire sample does not allow us to estimate this effect. A saturation design enables us to identify this potential spillover effect.

The most basic saturation design is the partial population design. Besides the 10 control villages where no one received the additional treatment, we also have untreated households in the villages where treatment was offered. These treated villages are assigned a coaching saturation level of less than one. The saturation level is nothing more than the proportion of households within the village sample that are to receive the treatment. In this case, the saturation level of the villages where the coaching will be offered is 50%. This design allows us to identify the existence of a spillover effect of coaching from the treated to the untreated within the villages with a positive saturation. Our chosen saturation and proportion of treated villages maximizes the statistical power to identify not only the effect on the treated but also the existence of possible externalities.

Data

The initial sample available for the study was as follows: 338 households in the 23 villages in the HW control group and 661 households in the 26 villages assigned to the HW ITT group. These villages belong to 5 different departments (Ancash, Ayacucho, Cajamarca, Cusco and Huanuco) and to 11 different districts in those departments. Due to the

Figure 1.2: Village assignment to HW and randomization into the coaching intervention



fact that some households were not located in the midline survey and the exclusion of a district in which the baseline information was found not to be credible, the total number of households in both surveys is 784 (261 observations in 20 villages and in the ITT group of HW with 523 observations in 25 villages), down from 873 valid surveys in baseline. Table 1.C.1 in Appendix 1.C compares baseline characteristics between those that exit that sample and those who remain. None of the differences are statistically significant.

In the 16 villages treated with HW and coaching, our population of interest (the universe of households that are both HW and *Juntos* users) is 477 households. Our sample size in those villages is 338 households. To achieve an effective saturation level of 50%, we offer coaching to 239 households, which is half of the households that belong to our population of interest. 142 of these households come from our sample and 97 are out of sample households . It is important to point out that 84% of the households in the sample that were offered coaching participated in at least 4 sessions. This means that these households finished at least the first phase of the soft skills program.

Our sample at the midline survey is reduced to 287 village households with both HW and coaching. Of the HW villages that were not treated with coaching, we have 201

households. Of the 142 households that were offered coaching we have information for 126 of them in both surveys. This last group is the ITT of coaching program.

1.5 Estimation Strategy

1.5.1 Balance

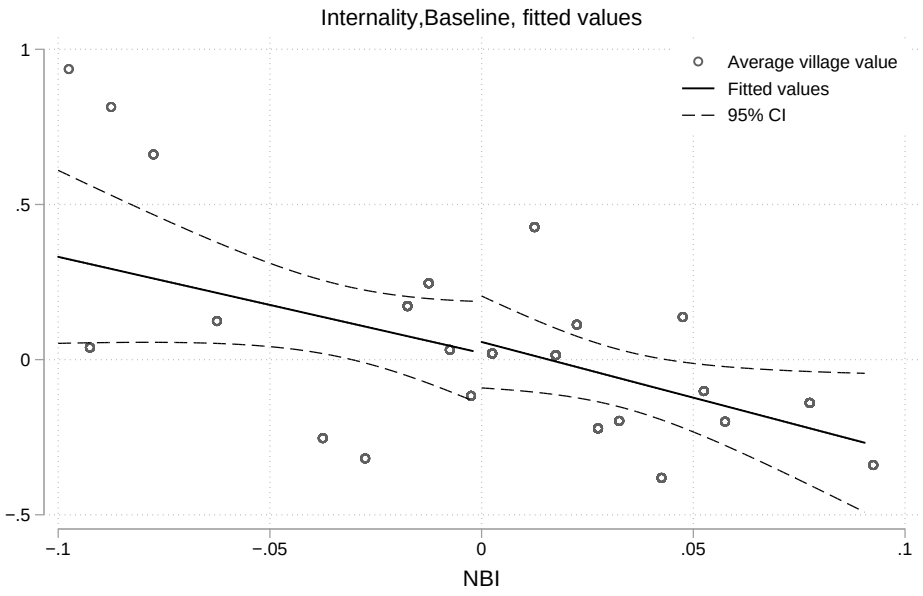
Village assignment to HW was not random. To be eligible for treatment, a village had to meet a series of requirements as described both in Section 1.4.1.1 and Section 1.4.4, including that at least 60% of the population had at least one NBI. To carry out the evaluation, we chose to compare villages that had 60% to 70% of their population with at least one NBI, with those that had 50% to 60% of their population wtih at least one NBI. In order to estimate the effect of the program consistently, the only relevant variable that jumps discontinuously at the threshold must be the assignment variable. We show that the set of variables relevant for our study are balance locally by estimating the following model:

$$Y_{i,v,0} = \alpha_0 + \tau HW_v + \beta \tilde{X}_v + \gamma HW_v \tilde{X}_v + \varepsilon_{i,v} \tag{1.1}$$

where $Y_{i,v,0}$ is the relevant variable for household i in village v at baseline, HW_v is a dummy variable equal to 1 if village v is to the right of the threshold of the running variable and 0 otherwise, and $\tilde{X}_v$ is the running variable (percentage of households with at least one NBI) centered around 0. If the sample is balanced, there should be no discontinuous jumps at the threshold, implying that τ should not be statistically significant for the variables.

A usual first step to see whether the condition of no discontinuous jump at the threshold holds for covariates is to visually inspect how the variable behaves before and after the threshold. Figure 1.3 shows a picture for the internality index. As expected, the index is higher for relatively richer villages (to the left of the threshold) and falls as the running variable moves to the right. Once it hits the threshold there is no discontinuous jump, which provides some evidence favoring the fulfillment of the sufficient conditions for the consistency of the estimator. The formal test which is estimating the model presented in Equation 1.1 for all the relevant variables is presented in Table 1.1. Variables included

Figure 1.3: Internality index at baseline



in this table are variables that the literature suggests may be correlated with psychological attributes. Besides the psychological variables the table includes: annual baseline income, households characteristics such as household size and plot size, characteristics of the household head including sex, age and years of schooling and a variable indicating if the household has used fertilizer in the past. τ is not significant for any variable. Furthermore, a chi-squared test based on a system of seemingly unrelated regression with as many equations as baseline covariates cannot reject the null hypothesis that the discontinuity gaps are jointly equal to zero.

Table 1.1: *Balance, RD*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Treatment	921.68	0.54	0.61	1.01	0.31	-0.01	-0.11	0.20	-0.16	0.18	0.07
	(639.78)	(0.83)	(0.64)	(0.74)	(0.38)	(0.05)	(0.11)	(0.14)	(0.20)	(0.21)	(0.14)
NBI rate	-9703.32	-6.64	4.67	-11.93	-6.50	0.23	3.25	-2.14	-1.37	0.27	-1.21
	(11934.04)	(7.64)	(10.48)	(15.24)	(5.16)	(1.01)	(2.53)	(2.26)	(2.74)	(1.87)	(2.01)
NBI rate ×											
Treat.	-3639.37	-1.95	-12.63	3.68	0.84	-0.09	-4.58	-2.67	4.89	0.61	-1.07
	(15506.86)	(17.33)	(13.18)	(18.98)	(7.47)	(1.17)	(3.45)	(2.90)	(4.47)	(3.94)	(2.88)
R^2	0.01	0.01	0.01	0.00	0.01	0.00	0.03	0.01	0.01	0.01	0.00
N	742	767	784	784	784	784	784	784	784	784	784

Standard errors clustered at a village level in parenthesis. All models include fixed effects per district. Dependent variable for each column is as follows: (1) Income (Soles), (2) Amount of land at disposal (hectares), (3) Years of education of household head, (4) Age of household head, (5) Household size, (6) Sex of household head, (7) Has used fertilizer, (8) Internality Index (9) Powerful others Index, (10) Chance Index, (11) Hope index
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Balance for villages assigned to coaching — We test for balance between villages that were assigned to coaching and those that were not. These villages are all to the right of the threshold. Table 1.2 shows the mean for the same variables as in Table 1.1for villages with no coaching (only HW) and the villages selected for coaching and the difference between the two. Household heads in the coaching villages are disproportionately female relative to non-coached villages: 21% are female in the former and only 14 % in the latter. This difference is significant at a 5% level. The rest of the variables are balanced. We again conduct a chi-squared test based on a system of seemingly unrelated regression with as many equations as baseline covariates and it cannot reject the null hypothesis that the difference between the means of the two groups are jointly equal to zero.

Table 1.2: *Baseline balance, coaching villages*

	No coaching	Coaching	Diff (2-1)
Socio-economic char.			
Total Income	3795.34	2969.68	-825.66
Plot size (ha)	1.96	2.34	0.38
HH head eaducation	6.37	6.61	0.24
HH head age	41.71	41.85	0.14
HH size	4.62	4.38	-0.24
HH head sex	0.15	0.21	0.06*
Technology			
Has used fertilizer	0.75	0.77	0.02
Psychological characteristics			
Hope Index	-0.02	-0.01	0.01
Internality Index	0.01	-0.02	-0.03
Powerful others Index	-0.05	0.07	0.12
Chance Index	0.00	0.03	0.03
N	236	287	

Standard errors clustered at a village level.

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

1.5.2 Specification

1.5.2.1 Effect of the program on income

We first investigate the regression discontinuity intention-to-treat (ITT) effects on income measured by our midline survey ($t = 1$). The impact of the HW program is estimated using (straightforward) variations of the following model:

$$Y_{i,v,1} = \alpha_0 + \tau HW_v + \beta \tilde{X}_v + \gamma HW_v \tilde{X}_v + \varrho_{i,v,0}\delta + \varepsilon_i \tag{1.2}$$

where $Y_{i,v,t}$ is the annual income of household i in village v in period 1. The rest of the variables are the same as in Equation 1.1: HW_v is a dummy variable equal to 1 if village v is to the right of the threshold of the running variable making the village eligible for treatment and 0 otherwise, and $\tilde{X}_v$ is the running variable (percentage of households with at least one NBI) centered around 0. We also include $\varrho_{i,v,0}$ which is a vector of control variables for household i in village v. This vector includes baseline income and all the variables in Table 1.2. The error terms of Equation 1.2 are clustered at the village level to account for the nature of the assignment to treatment.

Heterogeneous effects on income. We investigate potential heterogeneous effects in the midline income level by running separate regressions for different subgroups of households. In particular, our regressions differentiate between households with baseline levels of psychological measures below or above the median for each of the four psychological constructs. Running the above model with interactions to account for the potential heterogeneities may lead to inconsistent estimates of τ (Calonico et al. 2019).

1.5.2.2 Effect on psychological variables

We first estimate the regression discontinuity intention-to-treat (ITT) effects on psychological variables measured by our midline survey ($t = 1$). For this end, we first run the same model as in Equation 1.2 but with each of the four psychological variables as dependent variables. This regression will reveal the effect of being eligible for the programs on the psychological variables. We then proceed to estimate the regression discontinuity intention-to-treat (ITT) effects of the additional coaching intervention on psychological variables on the midline survey ($t = 1$). In order to achieve this, it is useful to identify three distinct groups to the right of the threshold that received different combinations of interventions:

1. Only HW. For this group, $HW_v^g = 1$ and 0 otherwise. This group only receives HW. The superscript g intends to differentiate this group from the variable HW_v which is equal to 1 for all households in villages to the right of the threshold.

2. HW+"Spillover". For this group, $S_{i,v}$=1 and 0 otherwise. This group is comprised

of households that did not receive coaching but that belong to villages v where coaching was offered. They only receive HW and potential spillovers from coached households.

3. HW+Coaching. For this group, $C_{i,v} = 1$ and 0 otherwise. This group is made of households that were offered the coaching intervention additionally to HW.

In order to estimate the distinct effect for each of the three groups, we compare each of them with the pure control group. For this, we estimate the following model:

$$P_{i,v,1} = \alpha_0 + \tau I_{i,v} + \beta \tilde{X}_v + \gamma I_{i,v} \tilde{X}_v + \varrho_{i,v,0}\delta + \varepsilon_{i,v} \tag{1.3}$$

where $P_{i,v,1}$ is the psychological outcome for the household head in village v in household i in period 1. $I_{i,v}$=$HW_v^g, S_{i,v}, C_{i,v}$, depending on which effect its being evaluated. The error term ($\varepsilon_{i,v}$) is clustered at the village level to account for within-village error correlation.

Households that were offered coaching had to be HW participants. Our research design did not contemplate a treatment arm where a subgroup would only receive the coaching intervention. Taking this into consideration, the model represented in Equation 1.3 may be biased when comparing the control group with households that were offered coaching. To account for the possibility of this bias, we restrict the analysis to HW participants to the right of the threshold and estimate the following model:

$$P_{i,v,1} = \alpha_0 + \tau_1 C_{i,v} + \tau_1 S_{i,v} + \varrho_{i,v,0}\delta + \varepsilon_{i,v} \tag{1.4}$$

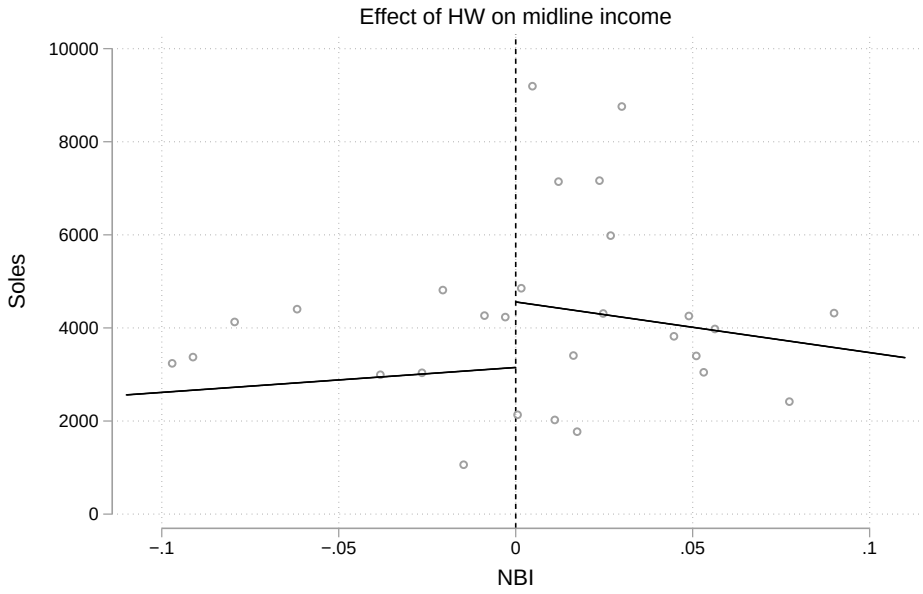
where again $P_{i,v,1}$ is the any of the four psychological outcomes for the household head in village v in household i in period 1, $C_{i,v}$=1 if household i in village v was offered the coaching and 0 otherwise, $S_{i,v}$=1 if household i in village v was not offered the coaching but belonged to a village where coaching was offered to others and 0 otherwise, and $\varrho_{i,v,0}$ is a vector of control variables for household i in village v. The model represented in Equation 1.4 will then have as a control group HW participants in non-coaching villages and will allow us to estimate the effect of coaching and spillovers on psychological variables. The results of the models in Equations 1.2-1.4 provide a complete picture of how the psychological variables are affected by HW and by coaching, both directly and indirectly.

1.6 Results

1.6.1 Effect of HW on annual income

Figure 1.4 shows graphically the result for Equation 1.2. The results from the linear model are presented in Table 1.3. The first two columns show the results for the whole centered bandwidth, from -0.1 to 0.1. The effect of being assigned to HW is close to USD 1100 in annual income and USD 800 when we include controls. For the model with controls, the effect is close to 40% larger than the average value for the households to the left of the threshold. Moreover, when we choose a smaller bandwidth, the effect is even larger. Columns 3 and 4 show the results for a centered bandwidth that goes from -0.05 to 0.05. The effect for this bandwidth is slightly larger for the model with no controls and for the model with controls shown in column 4, the effect is USD 1000. The results are robust to these specifications. We further estimate a non-parametric model using a triangular kernel and an MSE-optimal bandwidth selector. The effect of the local linear model with controls increases substantially and the ITT estimate is now over USD 1400. Table 1.4 shows the result for this estimation.

Figure 1.4: Effect of HW on Income



Heterogeneous effects on income. The previous results show that the HW intervention has

Table 1.3: *Effect of Haku Wiñay on midline Income*

	[-0.1, 0.1]		[-0.05, 0.05]	
	Income, ML	Income, ML	Income, ML	Income, ML
HW	1879.80**	1407.70**	1970.23*	1729.36**
	(817.99)	(634.39)	(1066.37)	(710.28)
Centered NBI	-2736.74	5354.87	-36081.57	-47928.76
	(11753.33)	(11859.54)	(41205.26)	(39026.50)
HW*NBI	-8485.06	-16237.27	73944.13	83410.67*
	(18487.31)	(17239.27)	(46237.76)	(43401.87)
Constant	3496.83**	3150.73	2804.95**	2257.26
	(1633.77)	(2006.65)	(1341.44)	(2226.12)
Controls	No	Yes	No	Yes
R^2	0.06	0.12	0.07	0.13
N	716	699	503	494
Mean control	3793.24	3793.24	3816.72	3816.72

Standard errors clustered at a village level in parenthesis. All models include fixed effects per district. First two columns show a model with a bandwidth of [-0.1, 0.1]. Columns 3 and 4 show a model with a bandwidth of [-0.05, 0.05]. Included baseline controls are land size, household size, years of education of the household head, age of the household head, if the household head has ever used fertilizers of any kind, sex of household head and baseline annual income. Also, baseline levels for each of the four psychological measures.
$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

a positive significant effect on midline income for our sample. We now want to investigate whether baseline psychological measures have any effect on the impact of the intervention on income. This question translates to finding out whether people with better initial psychological levels are able to use the resources of the program better than those with lower levels, as measured by midline income. In order to investigate this question, we estimate the model presented in Equation 1.2 for different subgroups of households, based on whether their baseline level of internality, chance, powerful others and Hope3 are each above or below the median.

The results for this analysis are presented in Table 1.5. The effects of the assignment to HW favor those above the median of the baseline level of internality (Panel A). For this group, the effect of assignment to treatment is around 1800 Soles (USD 1000). This

Table 1.4: *Effect of Haku Wiñay on midline Income, non-parametric*

	(1)
	Income, ML
RD_Estimate	2501.179***
	[691.149]
Robust 95% CI	[1234.391 ; 4544.228]
Kernel Type	Triangular
Observations used to the left	118
Observations used to the right	184
Conventional p-value	0.000
Robust p-value	0.001
Order Loc. Poly. (p)	1.000
Order Bias (q)	2.000
BW to the left	0.018
BW to the right	0.018

Standard errors clustered at a village level in brackets. Model includes fixed effects per district. Included baseline controls are land size, household size, years of education of the household head, age of the household head, if the household head has ever used fertilizers of any kind, sex of household head and baseline annual income. Also, baseline levels for each of the four psychological measures.
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

effect is significant at a 5% level. In comparison, the effect of assignment to treatment for those that have a baseline measure of internality below the median is only 630 Soles (USD 360 USD) and the effect is not statistically significant. The difference between the two coefficients is significant at a 10% level, confirming that households with higher initial levels of internality outperform those with lower ones. Panels B and C show the results for chance and powerful others. Households whose household head had baseline measures of these variables below the median (less external Locus of Control) appear to outperform those that have baseline measures above the median (more external Locus of Control), although most effects are not statistically significant.The effect for below the median baseline powerful others Index is statistically significant at a 5% level (close to 1800 Soles), and the difference is significant at a 10%. The bottom part of the table shows

Panel D, where there appears to be no difference in the effect on income of assignment to treatment for those above and below the median of the Hope3 index.

Table 1.5: *Income responses to heterogeneity in baseline psychological measures.*

	Control mean	HW Treatment effect
Panel A. By Baseline Internality		
Below median	3644.56	627.61
		(840.46)
Above median	3978.41	1803.68**
		(796.90)
Panel B. By Baseline Chance		
Below median	3755.11	1134.48
		(934.44)
Above median	3857.48	860.68
		(938.89)
Panel C. By Baseline Powerful others		
Below median	4091.28	1753.84**
		(848.23)
Above median	3445.53	103.60
		(727.73)
Panel D. By Baseline Hope3		
Below median	3439.99	1165.70
		(1013.23)
Above median	4149.37	900.69
		(1011.45)

First column reports the mean value of annual Income at midline below the cutoff. Standard errors clustered at a village level in parenthesis. All models include fixed effects per district. Included baseline controls are land size, household size, years of education of the household head, age of the household head, if the household head has ever used fertilizers of any kind, sex of household head and baseline annual income. Also, baseline levels for each of the other three psychological characteristics.

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

1.6.2 Effect on psychological variables of the programs

We now proceed to analyze the effect of the programs on psychological variables. On this section we explore the effect of being to the right of the threshold (being eligible for HW and in some places also for coaching) on the psychological variables in the midline survey. In the next one we look specifically to the effect coaching has on these variables. Figures 1.5 and 1.6 show graphically the results for Equation 1.2 for two variables, internality and powerful others, for illustrative purposes with no covariates. The first one shows what appears to be a discontinuous jump at threshold, while for the second one the jump is less evident. To formally test whether there is a discontinuous jump, Table 1.6 presents the impact of the HW treatment on all of the psychological variables. Columns 1 to 3 show the variables associated to Locus of Control (internality, chance and powerful others) and column 4 presents the Hope3 Index. The following columns have the same dependent variables but the regressions include baseline controls described in Section 1.5.1 plus baseline levels of the dependent variable. All of the regressions include fixed effects per district.

The table shows that HW has a positive effect on internality and on the aggregate measure of hope. Without controls, the effects of the HW intervention on these two variables are 0.22 and 0.32 and are statistically significant at a 5% and 1% levels, respectively. The psychological indices have been standardized. For a household that has a value of 0 for these two indices, belonging to a village just to the right of the threshold would imply moving from the 50th percentile to the 58th and 63rd percentile, respectively. Higher values for the chance and powerful others indices imply an increase of externality. Belonging to a village to the right of the threshold decreases the chance index and slightly increases the powerful others index, but none of these effects are statistically significant. The inclusion of baseline controls had only a modest effect of the point estimate for the intervention. As the findings are robust to the exclusion of baseline controls, for the rest of the analysis conducted in this paper we only present impact regressions with baseline controls.

Figure 1.5: Effect of HW on Internality Index

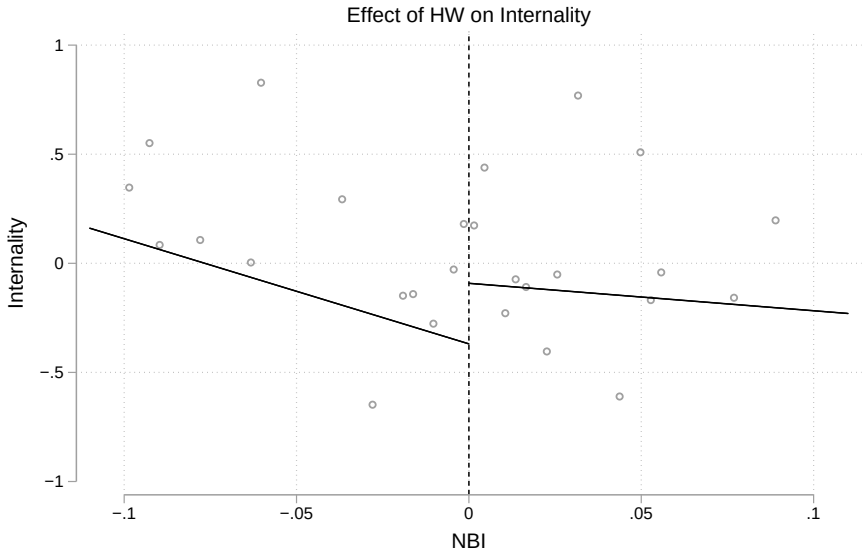


Figure 1.6: Effect of HW on Powerful others Index

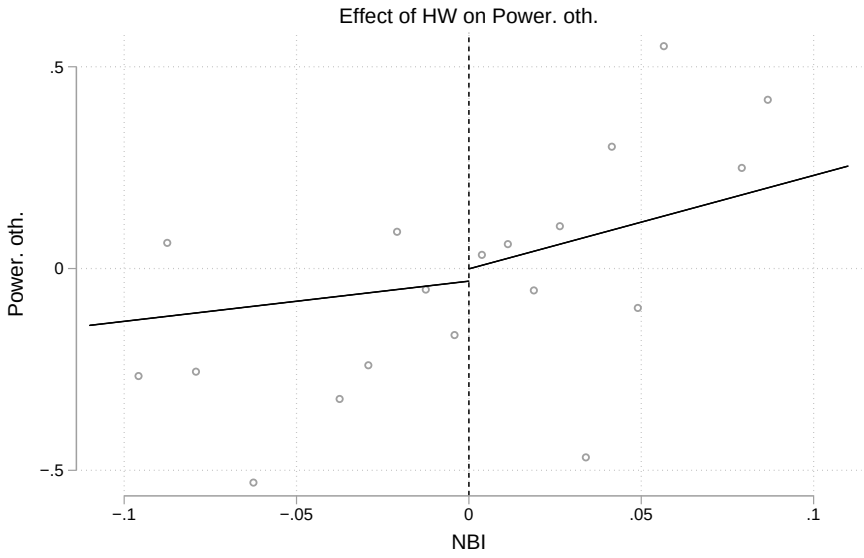


Table 1.6: *Regression discontinuity impact of HW assignment on psychological variables, Household head*

	Internality	Chance	Power. oth.	Hope3	Internality	Chance	Power. oth.	Hope3
HW	0.22**	-0.11	0.07	0.32***	0.18*	-0.09	0.10	0.33***
	(0.10)	(0.12)	(0.13)	(0.10)	(0.11)	(0.13)	(0.13)	(0.10)
Centered NBI	-3.76***	5.41***	1.32	-3.43*	-3.83***	5.59***	1.00	-3.50*
	(1.10)	(1.43)	(1.35)	(1.94)	(1.22)	(1.55)	(1.35)	(1.89)
HW*NBI	3.35	-8.61***	0.04	3.73	4.01*	-9.93***	0.22	3.32
	(2.08)	(2.91)	(2.48)	(3.15)	(2.11)	(2.88)	(2.70)	(3.04)
Constant	-0.28**	0.05	-0.06	-0.39**	-0.20	0.89***	0.50	-0.34
	(0.14)	(0.13)	(0.21)	(0.19)	(0.26)	(0.27)	(0.36)	(0.31)
Controls					✓	✓	✓	✓
R^2	0.15	0.14	0.12	0.12	0.19	0.17	0.15	0.13
N	755	755	755	755	738	738	738	738

Standard errors clustered at a village level in parenthesis. All models include fixed effects per district. Included baseline controls are land size, household size, years of education of the household head, age of the household head, if the household head has ever used fertilizers of any kind, sex of household head and baseline annual income.

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

1.6.3 The role of the coaching intervention

The evidence until now tells us that being to the right of the NBI threshold increases both the measures for internality and hope. But what is the role of the ancillary coaching intervention on the psychological variables? Do households with coaching increase their psychological indices more than households without it? If the answer to the previous question is yes, this fact together with the finding of heterogeneous effects of the program by baseline levels of psychological variables would provide indicative evidence of the potential of this intervention to further benefit households in terms of increased income. Our study design allows us to answer this question. A subgroup of the villages assigned to HW were also selected to participate on the coaching program which was offered randomly to around half of our sample in each of the selected villages. This means that to the

right of the threshold there are three distinct groups: i) households in villages where only HW was offered, ii) households in villages where HW and coaching were offered but who didn't receive the latter intervention (from now on referred to as the spillover group of households), and iii) households in villages where HW and coaching were offered and who were invited to participate in the coaching program (coached households). We estimate Equation 1.3 for each of the psychological variables comparing those to the left of the threshold with each of these groups. We further compare the treatment coefficients for each variable to test whether these are different across the three groups.

Table 1.7 presents the results for these regressions. The first column shows the results for the three regressions for internality. The effect of coaching is positive and significant at a 1% level. This effect is 4 times bigger than the effect for spillover households. In contrast, the effect for households that only received HW is negative and very close to 0 and it is not statistically significant. Households in the spillover group appear to benefit from the fact that their neighbors are being exposed to the ancillary treatment, but as we noted the effect is not significant. We test the joint hypothesis of equality for these three coefficients and we can reject it at a 5 % significance level (last row in the table). The table also shows a significant effect for chance. The coaching intervention decreases this measure, implying that there is a shift towards a more internal Locus of Control in that dimension. In the results in Table 1.6, there was no significant effect. With the result presented in Table 1.7 it is possible to see that this is due to the fact that the effect comes from the coached households and it is offset by the null result for the only HW group. The test for the equality of the three coefficients does not reject the null hypothesis. When testing only for the equality of the coefficients between only HW and HW + Coaching the null hypothesis is rejected at a 10 % significance level. The effects of both HW and the spillovers are also negative but small and not significant. The effects for the powerful others index are positive, except for the spillovers group. There are no significant effects for any of the three regressions for this index. Nevertheless, it is interesting that there is an increase in the coefficient for coaching and HW. This could be reflecting the fact of an increased reliance on both the *Yachachiq* and coaching agent, which would be an

unintended consequence of both programs. The effect for the Hope3 index is significant for all three regressions. The effect for the coaching subgroup (0.48) is more than 50% larger than for those assigned only to HW (0.31). Moreover, the effect on the index for households only assigned to HW is sizable. For the rest of the indices, the effect on the psychological variables appeared to come mostly from the coaching intervention. But for the Hope3 index, both interventions seem to increase substantially its value. The size of the effect for the only HW subgroup goes in line with what practitioners believe about the effect on "life attitudes" and "psychological outlook" of the lessons learned from *Yachachiqs* and interactions with implementers of HW (Conger 2016). The test for the equality of coefficients across the three models does not reject the null hypothesis. The p-value for the χ^2 statistic of the test comparing the coefficient for the only HW subgroup regression with that of the coaching subgroup regression is 0.11, making the difference only marginally not significant.

Table 1.7: *Regression discontinuity impact on psychological variables, by treatment group, Household head*

	Internality	Chance	Power. oth.	Hope3
Only HW	-0.04	-0.03	0.11	0.31***
	(0.13)	(0.16)	(0.15)	(0.09)
HW + Spillovers	0.11	-0.05	-0.03	0.27*
	(0.12)	(0.12)	(0.16)	(0.15)
HW + Coaching	0.44**	-0.29*	0.16	0.48***
	(0.17)	(0.16)	(0.18)	(0.13)
Control mean	-0.04	-0.09	-0.14	-0.14
$H_0: \tau_{HW} = \tau_{HW+S} = \tau_{HW+C}$				
p-val, χ^2	.011	.122	.322	.185

Standard errors clustered at a village level in parenthesis. All models include fixed effects per district. Included baseline controls are land size, household size, years of education of the household head, age of the household head, if the household head has ever used fertilizers of any kind, sex of household head and baseline annual income. Also, baseline levels for each psychological characteristic.

$^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

A potential problem with the model presented in Equation 1.3 and in particular with the results shown in the third row of Table 1.7, is that households offered to participate in coaching are households that ended up participating in HW, causing a problem of self-selection. This makes the control group to no longer be a valid counterfactual for this group, biasing the results. In order to address this problem, we estimate the model presented in Equation 1.4. Here, we only consider HW participants to the right of the threshold. Our control group becomes HW participants that do not belong to villages where coaching was offered. We measure the effect on households that received the additional coaching program and on households belonging to a village with coaching but that were not beneficiaries of the ancillary program.

Table 1.8 presents the results for the model in Equation 1.4. The results are quantitatively different from those presented in Table 1.7 for the internality index. The effect of coaching is reduced to only 0.06 compared to those who only receive HW. On the previous table, this difference is close to 0.5. Furthermore, the effect of coaching is not significant. For those who receive the spillovers, the effect becomes negative, although this is not significant either. For the other three indices, the results are consistent with those presented in Table 1.7. For the chance index, the difference is still -0.3 between households that were offered coaching and those that only received HW. Coaching makes the Locus of Control become more internal. The spillover effect is practically 0 and not significant, as in the previous table. For the powerful others index, the difference between those who had coaching and those who only had HW is still 0.05. Finally, as in the table above for the hope index, the difference between those who received coaching and those who only received HW is indistinguishable from 0.

Table 1.8: *Average impact of coaching on psychological variables, Household head, HW participants*

	Internality	Chance	Power. oth.	Hope3
Coaching	0.06	-0.29**	-0.00	-0.05
	(0.13)	(0.11)	(0.11)	(0.07)
Spillover	-0.04	-0.05	-0.15	-0.17**
	(0.10)	(0.10)	(0.11)	(0.07)
Constant	-0.14	1.37***	0.88**	-0.30
	(0.50)	(0.38)	(0.41)	(0.43)
R^2	0.23	0.16	0.19	0.16
N	357	357	357	357

Standard errors clustered at a village level in parenthesis. All models include fixed effects per district. Included baseline controls are land size, household size, years of education of the household head, age of the household head, if the household head has ever used fertilizers of any kind, sex of household head and baseline annual income. Also, baseline levels for each psychological characteristic.

$^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

These results imply that indeed there are gains in terms of increased psychological outcomes from being exposed to coaching. Both internality and chance shift towards a more internal locus of control, and the Hope3 measure also increases, although the difference between the HW intervention and the coaching for the latter is not big enough for it to be statistically significant. When accounting for potential selection bias, we see that the chance index for the coached households reveals a more internal locus of control compared to households that only receive HW. Putting together the pieces of evidence, there is indicative evidence that the ancillary coaching intervention could help make the HW intervention a better program. The betterment of the psychological variables through coaching together with the heterogeneous responses of income favoring high values of baseline psychological measures (particularly internality), point at a direction through

which coaching may help increase economic outcomes.

Effects of coaching on agricultural practices on the short term. These midline results do not allow us to see an effect of coaching on income since the program ended too close to our latest survey. We focus our attention on agricultural practices that are bound to see changes in the short run and that may lead to future returns. in particular, we look at the practices that may change as a consequence of the goals that participants in the program have set for themselves. Most of the participants set for themselves goals that aimed at increasing their agricultural income (Table 1.B.1 in Appendix 1.B). Among these, a high proportion of households wanted to increase their production of both guinea pigs and poultry. Technicians suggest that a first step for achieving a higher production of these animals is to have them spend the night in pens. HW offered the materials and technical advice for each household to build a structure for their animals to spend the night. From our visits to the field we were able to see that their were some households that had received the materials to build sheds or pens but that never started doing it. Hence, there is space for the coaching intervention to have an effect on this practice.

Table 1.9 shows the result for the same specification of Equation 1.3 but the outcome variable is a dummy equal to 1 if guinea pigs spend their night in a pen and 0 otherwise for column 1 and a dummy equal to 1 if chickens spend their night in a pen and 0 otherwise for column 2. The effects for both guinea pigs and chickens is significant for the coaching subgroup. Coaching increases the probability of guinea pigs spending their night in a pen by 100% over the control group. It is also 10 percentage points higher than the effect of only HW and spillovers. But we can't reject the null hypothesis of these 3 coefficients being the same. The effects are similar for chickens. Coaching increases the probability of chickens sleeping in a pen by 21 percentage points over the control, and 5 percentage points over the only HW and spillover groups. Although the differences between groups are not significant, these midline results may indicate future increased gains in income associated with the production of these animals.

Table 1.9: *Regression discontinuity impact on whether small animals spend their night in a pen, by treatment group*

	Guinea pig pen	Chicken pen
Only HW	0.22**	0.16
	(0.09)	(0.10)
HW + Spillovers	0.22**	0.16
	(0.09)	(0.10)
HW + Coaching	0.32***	0.21**
	(0.08)	(0.08)
Control mean	0.30	0.25
H_0: $\tau_{HW} = \tau_{HW+S} = \tau_{HW+C}$		
p-val, χ^2	.32	.402

Standard errors clustered at a village level in parenthesis.The model includes fixed effects per district. Included baseline controls are land size, household size, years of education of the household head, age of the household head, if the household head has ever used fertilizers of any kind, sex of household head and baseline annual income. Also, baseline levels for each psychological characteristics and baseline levels of whether guinea pigs (model 1) and chickens (model 2) spend their nights in a pen.

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

1.7 Concluding discussion

Poverty alleviation programs aiming at exclusively relaxing material constraints associated to households in extreme poverty may be missing an opportunity to enhance the economic effects of the program by not directly targeting psychological attributes. The loosening of internal constraints through a life skills coaching module proves to be an effective way of shifting the locus of control towards a more internal axis, making participants gain a sense of control over their lives and of increasing hope, which fosters an optimistic outlook about the future. Participants that enter the program with high levels of these measures are shown to make better use of the resources offered by the program since their midline

measures of annual income are substantially larger than those with lower initial values.

Our research questions were designed to help us unpack and understand how graduation programs work. These midline results point towards an answer. We were able to capitalize on this unique scenario of a graduation-type program and measure whether coaching by itself moves the needle of psychological attributes that have been found to be determinant of investment and technology adoption decisions. The endline survey will allow us to close the loop and confirm whether in effect, the suggestive evidence of the relevance of coaching on income through its effect on an increased level of internality is in fact true. As noted by Valdes et al. (2021), there may be a difference between psychological assets that have been formed based on previous experiences and related to personality traits and those that are being exogenously created by the type of interventions described in this paper. It could be that economic decision-making is primarily defined by the former, limiting the behavioral effect of the intervention. Nevertheless, coaching may be a way to start a process of endogenous build-up of psychological assets, and the endline survey will help understand whether this is the case.

Related to the previous issue, it remains to be seen whether the changes in the psychological variables are permanent. The literature regarding the stability of these measures, in particular the one associated with locus of control, is not conclusive. Our endline survey in the third quarter of 2021 will shed light on whether these effects are persistent or they dissipate with time. Moreover, we will have to account for the effects that the COVID-19 may have had on the livelihoods of the people in our survey. Transport in the country was disrupted for almost six months, decreasing the number of potential buyers for their products. For instance, the price of potato, which close to 70% of our sample produces and consumes, fell close to 70 % during the first months of the pandemic. This implies a major shock to their income. Also, since transportation was restricted, seasonal workers had a very difficult time transporting themselves to other locations. The government set up a fund to grant credit to smallholder farmers so that they can finance the 2020-2021 agricultural cycle. But these credits arrived late and were not available for the start of

the sowing season. It is very likely that the upcoming agricultural cycle is done with few inputs which will most likely affect the quantity and quality of the harvest. Hence, it may be the case that there is little relief from the COVID shock anytime soon. This shock may well undermine the gains made with the coaching intervention.

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Appendix

1.A Locus of control and Hope questionnaires

Table 1.A.1: *Locus of control questionnaire*

	Index	***Question***
i1	Chance	When you're doing well, is it because you're lucky?
i2	Powerful others	Is what happens in your life determined by powerful people?
i3	Internality	When you make plans, can you make them work?
i4	Chance	Is it easy for you to protect yourself from bad luck?
i5	Chance	Can fate be changed?
i7	Powerful others	Can you protect yourself if you conflict with someone powerful?
i8	Chance	Is it better to plan for the future? or leave the future to chance?
i9	Powerful others	To get what you want, must you please people more important than yourself?
i10	Internality	Can you decide what will happen in your life?
i11	Internality	Can you protect your personal interests?
i12	Internality	When you get what you want, is it because you worked hard to get it?
i13	Powerful others	For your plans to work, do you have to accommodate them to the wishes of the people in power?
i14	Internality	Is your life determined by your own actions?
i15	Internality	If you became a leader, would it be because of your abilities?
i16	Chance	When you get what you want, is it because you are lucky?
i17	Powerful others	For you to be a leader, do you need the approval of powerful people?
i18	Chance	To be a leader, do you have to be lucky enough to be in the right place at the right time?

Table 1.A.2: *Hope questionnaire*

	Index	***Question***
i19	Aspirations	What is better, accept reality? or dream of a better future?
i20	Aspirations	What is better, have aspirations for your family? Or accept each day as it comes?
i21	Aspirations	Are you satisfied with the production of your farm?
i22	Aspirations	When you have a farm, do you have to set goals?
i23	Aspirations	Do you have plans and goals to improve the productivity of your farm?
i24	Self-efficacy	Can you learn to use a new technology to make your farm more productive?
i25	Self-efficacy	Is effort very important for the optimal production of the farm?
i26	Self-efficacy	Is luck very important for the optimal production of the farm?
i27	Self-efficacy	Does the future of your farm depends on your own actions? or on the actions of others?
i28	Self-efficacy	If you try, can the production of your farm improve?
i29	Self-efficacy	Can people like you help bring about positive change in the community?
i30	Avenues	Can you solve the problems you find in your farm, even if they are difficult?
i31	Avenues	If your farm sales are low, do you know how to find other buyers?
i32	Avenues	Are you easily discouraged when there are problems in your farm?
i33	Avenues	If you lose the entire harvest in one season, would you try to plant other crops in the next season?

1.B Coaching plans and modules

Table 1.B.1 shows the categories where the goals set by the participants that finished all the coaching modules fall into. The goals related to small animals were mostly about building better pens for both chickens and guinea pigs so that the production could grow. Other agricultural related goals included increasing the number of cows, planting improved seeds for a variety of crops, making proper sheds for pigs, among others. Non agricultural goals included having a bakery, a restaurant and selling handcrafts.

Table 1.B.1: *Types of goals set by coaching participants*

Goals	**Number of households**	**Percentage of total**
Related to small animals	81	43%
Other ag goals	71	38%
Non-ag goals	37	20%
Total	189	

Table 1.B.2: *Coaching sessions, part 1*

Coaching modules, phase 1
Session 1: Getting to know me
Session 2: My personal goal for the benefit of my family
Session 3: My reality and options to achieve my goal
Session 4: My action plan

Table 1.B.3: *Coaching sessions, part 2*

Coaching sessions, phase 2
Session 5: My new habits and thoughts
Session 6: Commitment to what I want to achieve
Session 7: Making changes to solve difficulties
Session 8: Knowing resilience
Session 9: Looking for solutions
Session 10: Good communication in the activities I do
Session 11: Perseverance to achieve what I set out to do
Session 12: Acknowledging my fears
Session 13: Assessing my goal progress
Session 14: What I learned from these trainings

1.C Attrition

Table 1.C.1: *Attrition*

	HH in BL and ML	HW in BL	Diff (2-1)
Socio-economic char.			
Total Income	4780.12	5002.16	222.03
Plot size (ha)	2.15	2.08	-0.07
HH head eaducation	6.34	6.72	0.38
HH head age	41.67	41.49	-0.17
HH size	4.52	4.29	-0.22
HH head sex	0.18	0.26	0.07
Technology			
Has used fertilizer	0.41	0.34	-0.04
Psychological characteristics			
Hope Index	-0.00	0.01	0.01
Internality Index	-0.00	0.03	0.04
Powerful others Index	-0.01	0.11	0.13
Chance Index	0.00	-0.00	-0.00
N	784	89	

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Standard errors clustered at a village level

Chapter 2

Graduation programs and heterogeneous impacts: exploring sources of differentiated effects.

Juan Sebastian Correa

Graduation interventions have proven to generate substantive gains in productive outcomes for smallholder farmers in different pilot studies across multiple locations. Nevertheless, its impacts have been shown to be heterogeneous, and those benefiting the most are usually the better off. With the aid of simulations generated by an infinite horizon model parametrized to mimic a rural economy where households may be stuck in a low equilibrium, we aim at characterizing the importance of two possible sources of heterogeneity — covariate shocks and initial psychological assets — in the impacts of a graduation program that transfers both physical and psychological assets. We find that purging risk from the model has distributional effects that favor those in the middle percentiles of the conditional distribution for two productive outcomes (assets and production) relative to a case where the households are exposed to significant covariate shocks. Also, households with high initial levels of psychological assets (which act as an effective total factor productivity in our model) and of physical assets outperform those with lower initial assets.

Moreover, this group would have exited poverty even with out the transfer. These results suggest that it is possible to better an already successful poverty graduation program. Enabling insurance mechanisms against covariate shocks could be a way for programs to benefit a larger portion of the ultrapoor. At the same time, expanding pre-intervention activities to include an assessment of psychological asset status may aid in shifting some of the psychological asset-building activities from those that are well endowed towards those lacking such assets.

2.1 Introduction

In recent years, programs that aim at eliminating rural poverty by offering a package of interventions have become increasingly common. Multifaceted approaches intend to provide a "big push" out of poverty to beneficiaries and set them on a productive path. The most common of these approaches are poverty graduation programs which consist of offering productive asset transfers, cash transfers, and financial literacy and livelihood trainings for a period of time usually spanning between 2 and 3 years. The evidence shows that these programs are highly effective. Banerjee et al. (2015), which popularized the approach, show substantial positive impacts on a number of key indicators including productive assets, income and revenue for six different countries. In India, one of the countries in the previous study, Banerjee and Duflo (2011) report a 15% increase in household per-capita consumption 18 months after the beginning of the program. Considering program costs, this increase translates to a return of 27%, while investing the cost of the program in a fixed deposit account would have implied a return of around 10%. Bandiera et al. (2017) find that for a similar program targeting poor women in Bangladesh, the earnings of the beneficiaries increased by more than 20% relative to the control group, and sizable effects are also reported for productive assets 4 years after the initial transfer. The efficacy of these programs has also been demonstrated in conflict-affected regions. Arguelles et al. (2019) show that a program targeting poor women living in rural villages in Afghanistan is highly effective. Consumption and assets, among other well-being indicators increase substantially and the authors calculate an internal rate of return of 26% two years after the initial transfer.

As impressive as these impacts are, they are also highly heterogeneous. Banerjee et al. (2015) report that the pooled effect of the program in the six countries (India, Peru, Honduras, Ethiopia, Ghana, Pakistan) on asset accumulation is 10 times larger at the 90th percentile than at the 10th percentile. Bandiera et al. (2017) finds similar results. The effect of the program on productive assets at the lower percentiles is small and not statistically significantly different from zero, while at the upper percentiles it increases to around PPP US$ 3000. In Arguelles et al. (2019) the impact on the value of livestock

is more than PPP US$ 1000 at the 90th percentile compared to 0 at the 10th. These sizable differences are not only salient when comparing the top and bottom percentiles. In Banerjee et al. (2015), income is 4 times larger for the 90th percentile relative to the median and the value of productive assets is more than three times larger when comparing the same percentiles in Bandiera et al. (2017). The low reported effects not only at the the lowest percentiles imply that a significant portion of the targeted population may end up not graduating from poverty, highlighting the importance of understanding the sources of these differentiated impacts in order to design programs that generate results that are more evenly distributed across beneficiaries.

In this paper, with the aid of simulations, we explore the importance of two potential drivers of heterogeneous impact of a graduation program using a dynamic programming model. The first one is the exposure to covariate shocks. For smallholder farmers these usually manifest through climate related shocks, which can heavily accentuate rural poverty and are becoming more prevalent due to climate change. These shocks may lead to the effects of multifaceted programs being more muted. For instance, Banerjee et al. (2015) report that in Honduras, most of the chickens that had been transferred to the households as part of the program died due to an illness. Out of the six countries for which the paper reports impacts, Honduras was one of the worst performing. But besides shifting the distribution of impacts to the left, shocks may also have impacts on who along the (conditional) distribution of outcomes benefits from the program. Households in the upper percentiles may be more able to absorb the shock than those in lower percentiles and may still be able to escape poverty.

We consider psychological assets, and in particular perceived agency, as a second driver of impact heterogeneity. In recent years, increasing evidence has been generated on the negative effects of poverty on psychological well-being. These relations have been explored in regard to the impact poverty has on aspirations and wants (Genicot and Ray 2017; Dalton et al. 2016), and objective capacities such as "cognitive bandwidth" (Mullainathan and Shafir 2013; Mani et al. 2013) or preferences such as risk preferences and time discounting

(Haushofer and Fehr 2014). Another strand of the literature has focused on the impacts of poverty and negative events on "subjective" capacities, perceptions of control over one's life or on how such situations may instill hopelessness about the future, and how this translates into decisions that may perpetuate poverty (Lybbert and Wydick 2018; Wuepper and Lybbert 2017; de Quidt and Haushofer 2016; Moya and Carter 2019). One avenue through which these psychological perceptions of one's own capacities may operate and affect optimal decision making is by distorting the returns to investments. Individuals with "low" psychological assets could end up underinvesting the resources transferred by the program. Chapter 1 and Krovetz (2021) provide evidence in this regard from programs in Peru and Kenya.

In order to account for these possible sources of heterogeneity, we use a dynamic programming model and simulate the impacts of a means-tested graduation intervention which changes the initial levels of both physical and perceived agency in an economy exposed to covariate shocks. In parallel, we build a perfect counterfactual economy not exposed to the intervention, allowing us to estimate both an average treatment effect (ATE) and also the program's impact at different percentiles of the conditional distribution (quantile treatment effect, QTE) of a series of outcomes that measure economic well-being. We proceed to purge risk out of the model by eliminating the covariate shock, which enables us to compare the ATE and QTE impacts of the intervention with and without risk exposure [1]. After transforming the simulations to a riskless situation (or to a situation with beneficiaries that are completely insured), we further measure how initial differences in perceived agency affect the impact of the program. This step-wise account of potential sources of heterogeneities allows us to assess the relevance of both of these factors in generating differentiated effects of multifaceted programs.

How to strengthen the effects of graduation programs for a broader portion of the targeted population is still an open question. Recent research on graduation programs has sought to disentangle the effects of individual program components (Sedlmayr et al. 2020;

[1] Shocks only affect physical assets. We assume that psychological assets are already low enough and are not responsive to negative events.

Bossuroy et al. 2021). Interestingly, life-skills training modules appear to amplify the effect of the intervention on the outcome variables, including the accumulation of productive assets (ibid), providing empirical evidence of the relevance of addressing psychological constraints and how it affects economic outcomes.

The remainder of the paper is organized as follows. Section 2.2 describes the model, showing how risk and initial levels of psychological assets can affect decision-making. Section 2.3 explains in detail the graduation intervention and how it is incorporated into the model . Section 2.4 shows the effect of the program at the mean and at different percentiles in the conditional distributions of a series of economic outcomes. Section 2.5 explores the importance of covariate shocks and initial levels of psychological assets as sources of heterogeneity in in the impact of the graduation program and Section 2.6 concludes.

2.2 Model

Following closely Carter and Janzen (2017), we propose an infinite horizon model for household i. The household has initial physical assets A_{i0} and initial psychological assets P_{i0}[2]. We assume psychological assets, which in our model are represented by perceived agency, do not evolve with time and that in the same spirit of Carter (2016) and Lybbert and Wydick (2018) may be understood as an *effective* total factor productivity. An individual has both an *effective* and *potential* total factor productivity. In our model, individuals with low levels of agency will not take the necessary actions to realize their *potential* total factor productivity. de Quidt and Haushofer (2016) shows empirically that if an individual becomes too pessimistic about the returns to her effort, she may choose to exert low levels of effort or even no effort at all and as a consequence will not learn about her true returns to effort. Similarly, we assume that although in our model people will always engage in a productive activity, the low level of psychological assets will lead to a self-confirming expectation where individuals will not learn about their potential since they do not take small necessary measures — planning, paying attention, being organized

[2]For simplicity, the psychological assets of the household are those of the household head.

— that will reveal their full potential. Hence, the production function will reflect this psychological reality.

Household i seeks to maximize consumption c_{it} solving the following problem:

$$\max_{\{Cc_{it}\}_{t=0}^{\infty}} E_\theta[\sum_{i=0}^{\infty} \beta^t u(c_{it})]$$

s.t.

$$c_{it} \leq A_{it} + f(A_{it}, H_{it})$$

$$f(A_{it}, P_{i0}) = P_{i0} \max[(A_{it}^{\gamma^h} - F), A_{it}^{\gamma^l}]$$

$$A_{it+1} = [f(A_{it}, H_{it}) - c_{it}](1 - \theta_{t+1} - \epsilon_{t+1})A_{it}$$

$$A_{it} \geq 0$$

where the first constraint implies a consumption level lower than or equal to the value of physical assets plus income. The second constraint shows that households may choose from two different technologies for production. We assume that $\gamma^h > \gamma^l$, so that the household has to choose between a technology with high and a low productivity. The high productivity one has a fixed cost F, implying that it is only worthwhile using such technology if assets are equal to or larger than an asset level $\bar{A}$ [3]. The third constraint shows the equation of motion for physical assets. Assets in period $t+1$ are the savings from period t (remaining cash after consumption) plus assets from period t that remain after being subject to a covariate ($0 \leq \epsilon_{t+1} < 1$) and idiosyncratic shock ($0 \leq \theta_{i,t+1} < 1$) [4]. Covariate shocks are the same for all households and idiosyncratic shocks are specific to each household. These shocks are realized after the consumption decision in period t has already been taken and before each household makes a decision for period $t+1$.

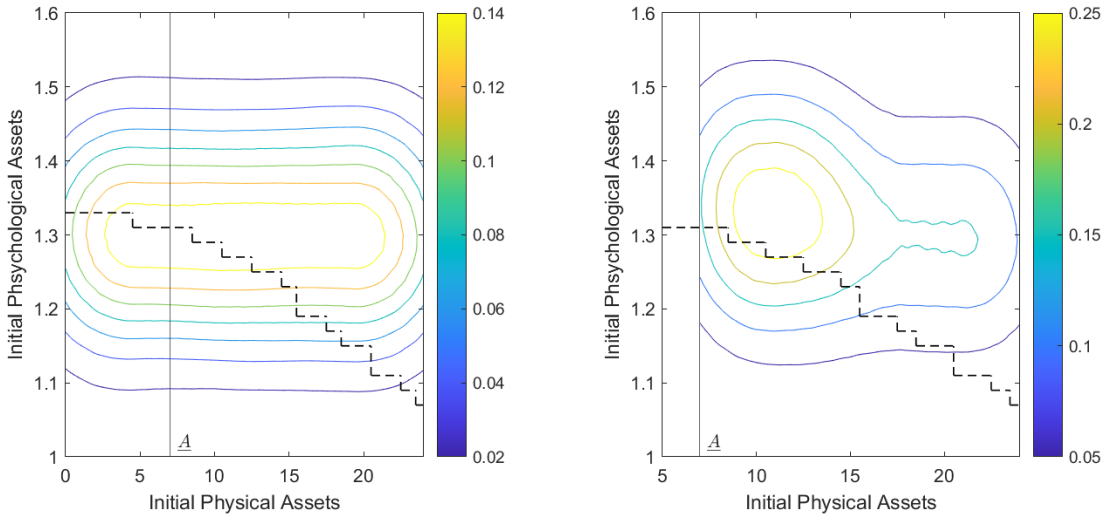
Figure 2.2.1a shows the joint initial distribution of perceived agency and physical assets. As an initial scenario, we assume zero correlation between the two [5]. Perceived agency

[3] $\bar{A}$ is implicitly defined by the inequality $A_{it}^{\gamma^h} - F > A_{it}^{\gamma^l}$

[4] In our current version of the model, the idiosyncratic shock is small and most all of the risk comes from covariate shocks. This specification aims to mimic sizable covariate shocks associated to climate related events.

[5] This is a simplifying assumption. A closer representation of reality would most likely present a

Figure 2.2.1: Joint distribution



(a) Initial

(b) After graduation transfer

is normally distributed while physical assets follow a uniform distribution. Both the covariate shock distribution and other model parameters are presented Appendix 2.A. We solve the model using value function iteration. For each period t, household i chooses optimal consumption based on its perceived agency level (which we assume does not change with time) and the expectation of physical asset holdings at the end of the current period. Model parameters are chosen to reflect a rural economy where a poverty traps exists. The non-convex technology and the chosen parameters generate both a low and a high level equilibrium. The existence of the two equilibria implies that there is a threshold defined by both assets for which households with initial combinations of assets below it converge to the low level one, and the opposite is true for those that start off with assets above it. This Micawber threshold, as Zimmerman and Carter (2003) define it, is represented by the dashed line in Figure 2.2.1a.

2.3 Graduation Intervention

Graduation programs have gained in popularity in recent years because of the impressive impacts reported from pilot studies in multiple locations around the world. In the poor

positive correlation between the two types of assets. Nevertheless, this correlation structure will most likely accentuate our findings. Exploring this further is part of our future research agenda.

rural contexts where these interventions take place, farmers face multiple constraints, and the success of graduation programs may stem from simultaneously tackling these limiting factors. Missing markets, lack of collateral and steep borrowing rates to access credit, food insecurity, and depleted psychological assets due to adverse economic situations, are some of the barriers that restrict farmers from making sustained and widespread behavioral and investment changes required to foster productive gains. While traditional agricultural and poverty reduction programs tackle these barriers in isolation, the graduation approach does it simultaneously, making it more likely to achieve transformative changes.

In this paper we restrict the modeling of the impacts of graduation programs to two dimensions: the transfers of a physical and psychological assets. We justify our focus on these two components as follows. First, the productive asset transfer is the central component of graduation programs and also one of the most costly (Banerjee et al. 2015). Second, the positive changes in psychological assets may be one of the key elements to the success of the program. For instance, Duflo (2012), when referring to the impacts of a graduation pilot in West Bengal, suggests that the program must have changed what she describes as "hope", for a lack of a better word, since the observed effects were too big to be accounted for by traditional economic explanations. In the same line of thought, program implementers have emphasized the importance of the coaching component, which is designed to directly address certain psychological shortcomings, in the positive results of graduation programs, arguing that it has been consistently considered by local implementers and by the participants as probably the most crucial element for the success of these types of interventions (de Montesquiou et al. 2018).

We use the model described above to simulate the transfer of both physical and psychological assets. The latter as described in the previous section, will be represented by perceived agency. A change in this asset may come from the dedicated coaching component of the program which tackles directly this asset, or from training in productive activities which may lead to the farmer gaining in confidence. We do not explore explicitly

the source of this gain in this paper [6].

As in the real world, we target households by means testing. Eligible households are those for whom $A_{i0}<\underline{A}$, where $\underline{A}$ represents an asset poverty line, or the assets associated with the low steady state. These households receive a transfer equal to $\underline{A}$ at the end of period 0, implying that in the absence of negative shocks, all treated households will start period 1 at or above this poverty line. Programs in reality transfer assets that represent a significant portion of the annual income of the beneficiaries. Blattman et al. (2016) report on a program transferring a grant that was 2.5 times larger than the annual earnings of beneficiaries, while Banerjee et al. (2015) describes that the transfer to Ethiopian farmers was worth PPP US$1228 per household.

Complementing the physical asset transfer, all eligible households (those for which $A_{i0}<\underline{A}$) receive a psychological asset transfer, $\underline{P}$, in period 0 that increases perceived agency at the beginning of period 1. The size of the transfer is based on Chapter 1, where we report the effects of a graduation program in Peru and are able to disentangle the contribution of a coaching component to changes in a series of psychological assets.

Figure 2.2.1b shows the initial joint distribution after eligible households receive the graduation transfer. The transfers were equal to 7 units of the physical asset and 0.06 of the psychological asset. The distribution shifts relative to Figure 2.2.1a and more mass is concentrated towards the north-east of the Micawber threshold, again represented by the dashed line. It is worth noting that the transfer does not push every eligible household beyond the Micawber threshold, implying that the transfers are simply not enough for those households that start off towards the origin of the plane. Hence, this group of households will converge to the low equilibrium, even in the absence of shocks. In the next section we analyze how the dynamics evolve and compare a group exposed to the transfer with a perfect counterfactual which did not take part of the graduation program.

[6] In Chapter 1 we are able to experimentally tease apart the effect of the coaching component in a graduation program in Peru on a series of psychological variables, finding evidence of its importance

2.4 Simulations Analysis

To run the simulation analysis, we randomly choose 1015 households (defined by combinations of initial levels of physical and psychological assets) from the space in Figure 2.2.1a such that $A_{i0}<\underline{A}$. This subsample is our control group. We clone this subsample and give this new subsample the graduation package. This is our treatment group. The control and treatment groups form our "empirical" sample for which we simulate the model for 10 periods. For each period, every household is subject to the same covariate shock but to their own household specific idiosyncratic shock that destroy a portion of the accumulated assets.

In the next subsections, we estimate the ATE and QTE for the observations in the 10th period. Each period represents an agricultural cycle that lasts close to 6 months. Hence, after 10 periods (5 years) we would be capturing the medium to long-term impacts of the program.

It is worth highlighting that the "noise" in our model is only coming from the small idiosyncratic shocks. This is reflected in the narrow confidence intervals presented in the following analysis. Also, the subsequent analysis only shows the realization of one covariate shock structure. Of course, varying this covariate shock structure will undoubtedly generate different results. We randomly chose a covariate shock structure where the shocks were substantially large in the first five periods, and where there were no shocks afterwards. We imposed this restriction in order to allow the dynamics to act for enough periods after the shock before reaching the 10th period such that the paths towards the equilibria are more clearly established. Since our aim is to create an analogue to a real-world scenario, assuming a unique covariate shock structure for all the sample is a defensible assumption.

ATE

The approach described above mimics an RCT with the advantage that by construction both samples are identical, hence, we get a perfect counterfactual. Equation 2.1 shows the model we estimate to compare the the treatment and control groups, where τ is the

ATE.

$$y_{it} = \alpha_0 + \tau G_i + \varepsilon_{it} \tag{2.1}$$

$y_{i,t}$ represents the outcome variable for household i en period t and G_i is a dummy equal to 1 if household i received the Graduation package. Table 2.4.1 shows the results for the previous regression for period 10 for four different outcomes: consumption, value of assets, production and variable that is equal to 1 if household i is non-poor and 0 otherwise. The latter variable takes into consideration whether the production level for household i (its potential earnings) would, under optimal behavior, yield a consumption level equal to the consumption poverty line. In other words, this poverty line is the consumption level associated to the low equilibrium.

Table 2.4.1: *Treatment effect in period 10, early shocks.*

	Cons.	Assets	Prod.	Non-poor
Graduation	-0.24***	4.20***	0.53***	0.26***
	(0.01)	(0.06)	(0.01)	(0.01)
Constant	4.64***	6.12***	5.11***	0.39***
	(0.01)	(0.04)	(0.01)	(0.00)
R^2	0.03	0.17	0.10	0.07
Mean control	4.64	6.12	5.11	0.39

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

The table shows that physical assets are almost 70% larger for the treated households compared to the control group. Consumption is slightly lower for the treatment group, showing that treated households are initially using resources for investment. Production value slightly increased and the probability of escaping poverty increases by 26 percentage points relative to the control group. It is worth noting that under the scenario presented, households suffered a series of covariate shocks in the first periods that destroyed a significant portion of their assets, explaining the change in assets being lower than the transfer, which was equal to $\underline{A}$=7.

2.4.1 Quantile Treatment Effects (QTEs)

Quantile regression analysis provides a useful tool to further analyze whether treatment impacts are similar across different quantiles of the dependent variable or not. If this is the case, the ATE estimated in the previous subsection would reflect the impacts of the graduation intervention across the distribution of the outcome variable. Nevertheless, previous evidence suggests that there is significant impact heterogeneity and that conditional quantile treatment effects vary, and are higher for the upper quantiles (Banerjee et al. 2015; Bandiera et al. 2017).

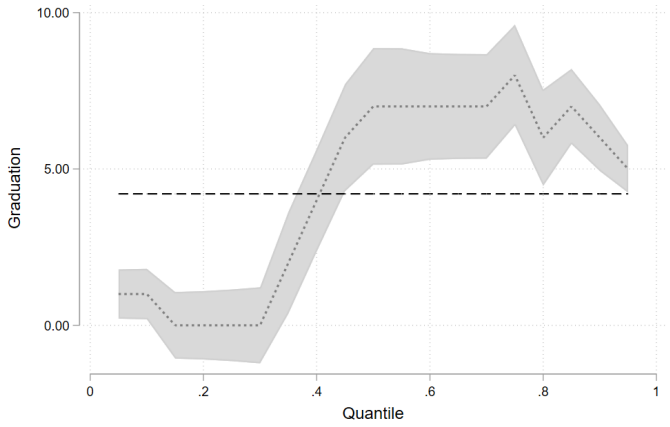
We restrict our QTE analysis to two outcomes: physical assets and production. Because of the nature of the model, consumption after ten periods has not stabilized, making it is less informative of the effects of the program, and this approach is not informative for the binary poverty outcome variable.

Figures 2.4.1a and 2.4.2a show the results for the quantile regressions for assets and production. Figure 2.4.1a shows that treatment effects on assets are nonnegative at each quantile, but they are significantly larger for quantiles larger than 0.4. For lower quantiles, the effect of the intervention is zero, except at the 0.1 quantile, considering a 95% confidence interval. At this quantile, the effect is 4 to 6 times smaller relative to the effect reported at the top quantiles.

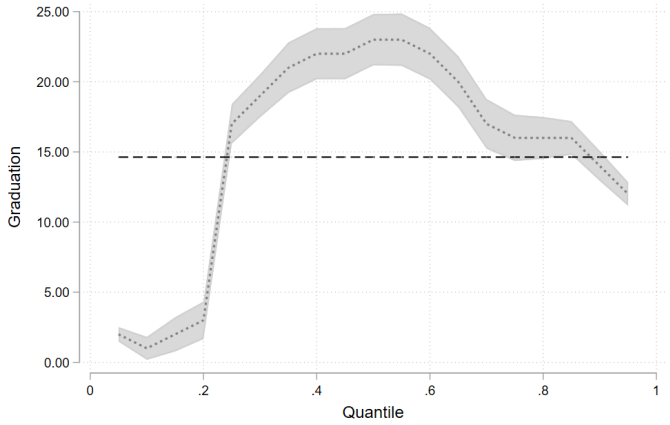
Figure 2.4.2a shows the effects on production and reveals a similar pattern to the previous one: at lower quantiles, the impacts are smaller relative to the effect reported at larger ones. The effect is even negative at the lowest quantiles. The results for both outcomes show that the ATE, represented by the dashed line in each figure, hides an underlying heterogeneity that becomes manifest when considering the impact effects across the conditional distribution. These results are highly consistent with what has been found in the empirical literature (Bandiera et al. 2017; Banerjee et al. 2015)

Figure 2.4.1: Quantile treatment effects on assets, period 10.

(a) Early shocks



(b) No shocks



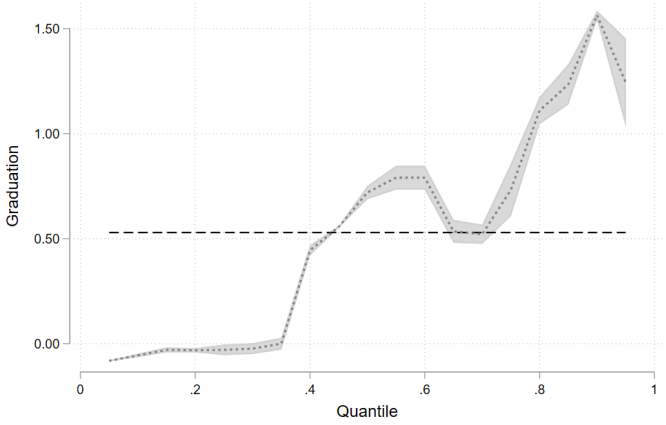
2.5 Heterogeneity decomposition

2.5.1 Risk

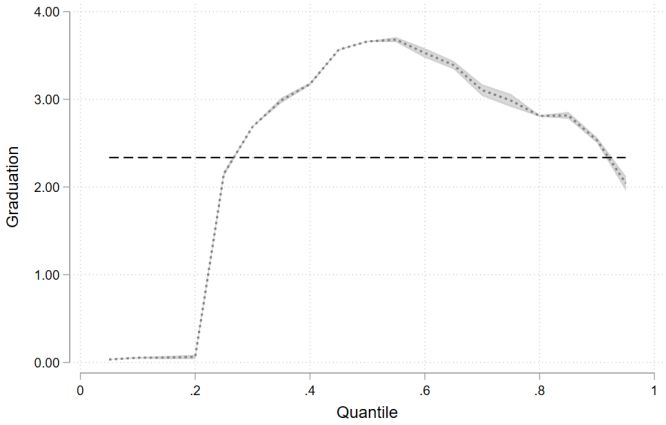
The previous results reveal that the effect of the program is highly skewed towards higher quantiles. Thus, even within asset-poor households, there is significant variation in the effect of treatment. Up until now, the analysis has considered a scenario where both treatment and control groups are exposed to significant covariate shocks that destroyed assets in the first periods. The advantage of using simulations is that it allows us to easily switch on and off certain parameters or change situations that may shed light on the underlying mechanisms explaining observed empirical results. Shock exposure is one

Figure 2.4.2: Quantile treatment effects on production, period 10.

(a) Early shocks



(b) No shocks



of these scenarios, where using real-world data to uncover its distributional effects on outcomes may be very challenging. Table 2.5.1 shows results for the the model presented in Equation 2.1 if we artificially eliminate the covariate shocks (the small idiosyncratic shocks are still present). This can also be thought as if a social protection mechanism kicks in and replaced the lost assets.

Table 2.5.1: *Treatment effect in period 10, no shocks.*

	Cons.	Assets	Prod.	Non-poor
Graduation	0.91***	14.63***	2.34***	0.37***
	(0.01)	(0.11)	(0.02)	(0.01)
Constant	4.75***	9.17***	5.59***	0.41***
	(0.01)	(0.08)	(0.01)	(0.00)
R^2	0.32	0.42	0.36	0.14
Mean control	4.75	9.17	5.59	0.41

$^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

The effects for the four outcome variables are clearly higher without the presence of the covariate shocks. Asset accumulation more than doubles relative to the control group, compared to the shock scenario where the increment was less than 50% of the asset holdings for the control. Both consumption and production also increase much more under this world with no risk relative to the control group. These results are not surprising. Asset destruction will lead to lower levels of asset accumulation, consumption and production. It is worth noting that the probability of being non-poor increases by 37 percentage points. These results reveal that the ATE increases when risk is eliminated. Taking a look QTE for this scenario will reveal how removing risk affects the quantile effects, and shed light on whether upper percentiles are benefiting more from the program relative to lower ones.

Figures 2.4.1b and 2.4.2b show the results for the QTE for assets and production. Both figures reveal that indeed, purging risk leads to positive significant treatment effects at more quantiles. Figures 2.4.1a and 2.4.2a show there are significant benefits of the intervention only at quantiles larger than 0.4 and that these benefits are larger than the ATE. Figures 2.4.1b and 2.4.2b reveal that at all the quantiles to the right of quantile 0.2 for assets and production there are benefits from the graduation program, and that the effects at quantiles larger than 0.25 are larger than the ATE. Eliminating risk does make the impacts of the intervention positive and economically relevant for a larger number of

quantiles. A second result that stems from this scenario is that at higher quantiles the effects dissipate, and the largest effects are reported at middle quantiles. The treatment effect increases for both assets and production until the 0.6 quantile but decreases at upper quantiles. In a world with no risk, households with higher initial assets will not benefit much from the intervention since they will reach the high equilibrium eventually.

2.5.2 Low initial assets

If households could perfectly insure against risk, the impacts of the program would be more wide-spread. But there is still a significant amount of beneficiaries for which the intervention generates no gains. We look at the effects of the program accounting for different initial levels of assets, both physical and psychological, in order to further understand potential sources of observed heterogeneities. We do this by estimating Equation 2.2 below using OLS:

$$y_{i,t} = \alpha_0 + \tau G_i + \beta_1 P_i^H + \beta_2 A_i^H + \beta_3 G_i \times P_i^H + \beta_4 G_i \times A_i^H + \varepsilon_i \tag{2.2}$$

where P_i^H (A_i^H) is a dummy equal to 1 if the initial level of perceived agency (physical assets) is above the median value, and 0 otherwise. The last two terms of Equation 2.2 consider the interaction between the graduation program and each of the previously described dummies. These terms will shed light on whether households who have initial assets — physical and/or psychological — above the median, benefit more from the program. This entails testing whether β_3 and/or β_4 are equal to 0.

Table 2.5.2 presents the results for the estimation of Equation 2.2. The table shows that those that start off with high initial levels of physical assets and perceived agency outperform households with lower initial assets. The only exception is for those households with an initial high level of perceived agency, whose consumption is lower relative to those with a low initial level. This can be explained by their comparatively large factor productivity (perceived agency) which shifts the allocation of resources towards more investment. This is possible to see when looking at the effects on asset accumulation of having above median initial perceived agency. The results are substantial and relatively bigger than the effects associated to having initial physical assets above the median. The

same holds for production and poverty, with the chances of a household being non-poor also increasing significantly, while the effect is more muted for households with above median physical assets.

The interaction terms also display mostly positive results. For consumption, the extra boost that the graduation program gives in terms of transfers of both assets generates a positive effect. Even those that are above the median in terms of initial perceived agency benefit from the program, and this effect overshadows the negative one, making the overall effect on consumption positive for this subgroup. The effects on assets and production follow the same pattern: larger effects are reported for households with high initial assets, and the results are stronger for high initial levels of perceived agency.

The results for the poverty variable are very telling. The constant is equal to -0.04, which reflects that households that start off with low initial levels of both assets have no positive probability of exiting poverty after 10 periods. This results shows what we already new from Figure 2.2.1b: households below the Micawber threshold are stuck in the low equilibrium.

Table 2.5.2: *Heterogeneity in initial psycho asset, period 10, no shocks*

	Cons.	Assets	Prod.	Non-poor
Graduation	-0.03***	12.39***	1.70***	0.57***
	(0.01)	(0.13)	(0.02)	(0.01)
Above median				
I. Psych. assets	-0.48***	10.12***	1.69***	0.90***
	(0.01)	(0.11)	(0.02)	(0.01)
Above median				
I. Assets	0.18***	4.02***	0.67***	0.05***
	(0.01)	(0.11)	(0.02)	(0.01)
Graduation ×				
Above median				
I. Psych. assets	1.50***	1.47***	0.88***	-0.50***
	(0.01)	(0.15)	(0.03)	(0.01)
Graduation ×				
Above median				
I. Assets	0.50***	3.15***	0.46***	0.07***
	(0.01)	(0.15)	(0.03)	(0.01)
Constant	4.88***	2.50***	4.48***	-0.03***
	(0.01)	(0.09)	(0.01)	(0.00)
R^2	0.66	0.71	0.73	0.65
Mean control	4.75	9.17	5.59	0.41

$^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

The previous results reveal a high impact heterogeneity based on the initial levels of physical assets and of perceived agency. Overall, the highest impacts come from those that received the graduation program and had an initial level of perceived agency above the median. To further disaggregate these results we run the regression presented in

Equation 2.3 below:

$$\begin{aligned} y_{i,t} =& \alpha_0 + \tau G_i + \gamma_1 P_i^L \times A_i^H + \gamma_2 P_i^H \times A_i^L + \gamma_3 P_i^H \times A_i^H \\ &+ \gamma_4 G_i \times P_i^L \times A_i^H + \gamma_5 G_i \times P_i^H \times A_i^L + \gamma_6 G_i \times P_i^H \times A_i^H + \varepsilon_i \end{aligned} \tag{2.3}$$

where P_i^L (A_i^L) is a dummy equal to 1 if the initial level of perceived agency (physical assets) is below the median value, and 0 otherwise. This model disaggregates further the previous results since it clearly differentiates between four groups:1) below median initial levels of physical assets and perceived agency (reference category), 2) below median initial level of perceived agency and above median initial level of physical assets, 3) above median initial level of perceived agency and below median initial level of physical assets, and 4) above median initial levels of physical assets and perceived agency. Table 2.5.3 below shows the results for this regression.

For consumption, graduation has the most impact for group 4. Group 3 benefits much more from the transfers than group 2, although the direct effect of belonging to group 3 as is the one for belonging to group 4. These two groups would have sacrificed present consumption for future gains regardless of the graduation transfer. This is further evidenced by the impact results on asset accumulation, where again the direct effects of belonging to each of those two groups is high compared to belonging to group 2 and to group 1. The effect is more than twice as big for group 4 compared to group 3, which speaks to the relatively good position from which group 4 started off. Also, the impacts of the program are the largest for group 2 and the smallest for group 4 (not considering group 1). Again, group 4, and to a certain extent group 3, could have performed well without the program.

Similar results are obtained for production. The only difference is that the impact of graduation for group 2 is lower than that for group 4. This does not change that the overall impact is the largest for group 4. Finally, the results for the variable representing being non-poor summarizes the previous findings. For group 4, the effect of graduation is almost 0, implying that in the absence of the program this group of households, in the absence of risk, would have escaped poverty anyway. The importance of the program increases as we go from group 4 in order down to group 1.

Table 2.5.3: *Heterogeneity in initial assets, period 10, no shocks*

	Cons.	Assets	Prod.	Non-poor
Graduation	-0.03***	10.01***	1.34***	0.49***
	(0.01)	(0.14)	(0.02)	(0.01)
Below med. I. Psych. assets×				
Above med. I. Assets	0.02*	0.63***	0.08***	-0.00
	(0.01)	(0.14)	(0.02)	(0.01)
Above med. I. Psych. assets ×				
Below med. I. Assets	-0.66***	6.49***	1.06***	0.84***
	(0.01)	(0.15)	(0.02)	(0.01)
Above med. I. Psych. assets×				
Above med. I. Assets	-0.28***	14.45***	2.41***	0.96***
	(0.01)	(0.15)	(0.02)	(0.01)
Grad. ×				
Below med. I. Psych. assets ×				
Above med. I. Assets	0.50***	7.98***	1.19***	0.23***
	(0.02)	(0.20)	(0.03)	(0.01)
Grad. ×				
Above med. I. Psych. assets×				
Below med. I. Assets	1.51***	6.65***	1.66***	-0.33***
	(0.02)	(0.21)	(0.03)	(0.01)
Grad. ×				
Above med. I. Psych. assets×				
Above med. I. Assets	2.00***	4.18***	1.28***	-0.45***
	(0.02)	(0.21)	(0.03)	(0.01)
Constant	4.96***	4.17***	4.77***	0.00
	(0.01)	(0.10)	(0.02)	(0.00)
R^2	0.68	0.73	0.75	0.66
Mean control	4.75	9.17	5.59	0.41

$^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2.5.4 summarizes the results from the previous table by presenting the overall effect on the outcomes (net of the constant) for group 2, 3 and 4. We additionally present what percentage of the effect is explained by the program. These results present a very clear picture of the importance of the program for each of the groups defined based on initial levels of physical assets and perceived agency. For consumption, the program is clearly beneficial for groups 3 and 4. Without the intervention, these two groups would have consumed much less, and this would have been specially for the first few periods.

For assets, the effect reverses. The graduation transfers are the most important for group 2, for which almost all of the observed effect can be attributed to the intervention. For group 4, participating in the program only accounts for 50% of the observed effect, and this value increases to 72% for group 3. As stated earlier, these two groups would have significantly invested in assets without the program. Production reflects the same story than assets. And finally, we are able to see that only 4% of the reduction in poverty for group 4 can be attributed to the program, while this number increases to 16% for group 3. For group 2 (and group 1 by definition) all of the effect on the variable reflecting escaping the low equilibrium is attributable to the program.

Table 2.5.4: *Total effect per group and percentage that can be attributed to the program.*

	Cons.		Assets		Prod.		Non-poor	
	Effect	% grad.	Effect	% grad.	Effect	% grad.	Effect	% grad.
2. Low, High	0.49	96%	18.62	97%	2.61	97%	0.72	100%
3. High, Low	0.82	180%	23.15	72%	4.06	74%	1	16%
4. High, High	1.69	116%	28.64	50%	5.03	52%	1	4%

2.6 Conclusion

This paper attempts to explore potential sources of the heterogeneous effects observed in graduation programs. We do this by simulating an infinite horizon model where households make decisions on whether to invest in a high or low productivity technology, and where there is a fixed cost associated to the high yielding one. The chosen parameters

and this non-convex technology set generate two different optimal investment paths and two different equilibria. As a consequence, there exists a boundary (Micawber threshold) based on initial conditions that will dictate whether a particular household will converge to the "high" or "low" equlibrium. By generating two identical economies, where the only difference between the two is that in one, potential beneficiaries are exposed to a transfer of a physical and a psychological asset, hence, altering which households cross the Micawber threshold, we are able to compare outcomes after ten periods of running the model. Additionally, households are exposed to a series of covariate shocks in the first periods which reduce dramatically their assets.

The shocks and the initial levels of assets, both psychological and physical, may be possible explanations as to why observed effects of graduation programs are not evenly distributed. We find that by purging risk of off the model, the effect of the graduation program on assets and production is significant for quantiles larger than 0.2, while in the presence of shocks significant effects only appeared after the 0.4 quantile for both outcomes. The main driver of this result is the size of the shock being removed. These shocks were sizable and represented a loss in asset value of around 50% on average for the first two periods. Nevertheless, climate change is increasing both the severity and frequency of climate related shocks, making our shock structure appear appropriate to describe events in the real world.

We also find differentiated impacts that depend on initial levels of psychological assets represented by perceived agency and of physical assets. The implications of the program are distinct and depend on the group to which each household belongs to (both initial assets below the median, one above and the other below, the opposite, and both initial assets above the median). The transfers are able to lift out of poverty a substantial amount of households, but for half of those that belong to the group that start off with asset levels below the median, the program does not provide a big enough push to set them on the high equilibrium path. Moreover, those with high initial levels of perceived agency perform very well, and we show that the majority would not need the transfer to

escape poverty. Again, the size of the transfers are the key element in this analysis. The size of the psychological transfer is in line with some of the literature in the topic, but may be on the upper bound. A future step is to look at how sensitive the model is to changes in the transfer size of both psychological and physical asset.

Simulations present obvious shortcomings. The parametrization, the shock structure and the transfer size determine the size of the effects. As mentioned earlier, understanding how the model responds to changes in some of these parameters, in particular the transfer size, is key to having a more robust model. At the same time, the model is meant to describe and not to predict. While this may limit the types of policy recommendations that may stem from this analysis, in particular those associated with transfer sizes, the paper may help to advance the way in which graduation and other similar multifaceted programs are targeted and rolled-out. In particular, our findings call for increased efforts in understanding the complementarities between psychological and physical assets and to assess the psychological status of the target population before the transfer of assets take place. Exploring the correlation between the two assets may inform subsequent targeted transfers of both assets, in the form of additional time spent on life-skill coaching modules with those whose psychological assets have been found to be low. This may not necessarily imply increased costs, since the resources may come from reduced visits to households that are found to do well in terms of psychological assets. Varying the size of the physical assets may come at a higher political cost making it unfeasible in most scenarios. Exploring the effect of aiming at "leveling of the field" in terms of psychological assets may pay off in terms of more evenly distributed impacts across the population.

Our model also highlights how expanding the program towards insurance literacy and the offering of such products may be beneficial. To our knowledge, the financial literacy modules in graduation programs do not focus on these topics, leaving an evident gap in terms of valuable knowledge about how to protect investments. Additionally, some of the program funds destined to each household may go directly towards insurance. On top of this, a progressive contributory scheme can be set up by the program and the pot may be

used in case a shock hits, and it could insure not only against covariate shocks but also against idiosyncratic ones, although the latter would need further considerations.

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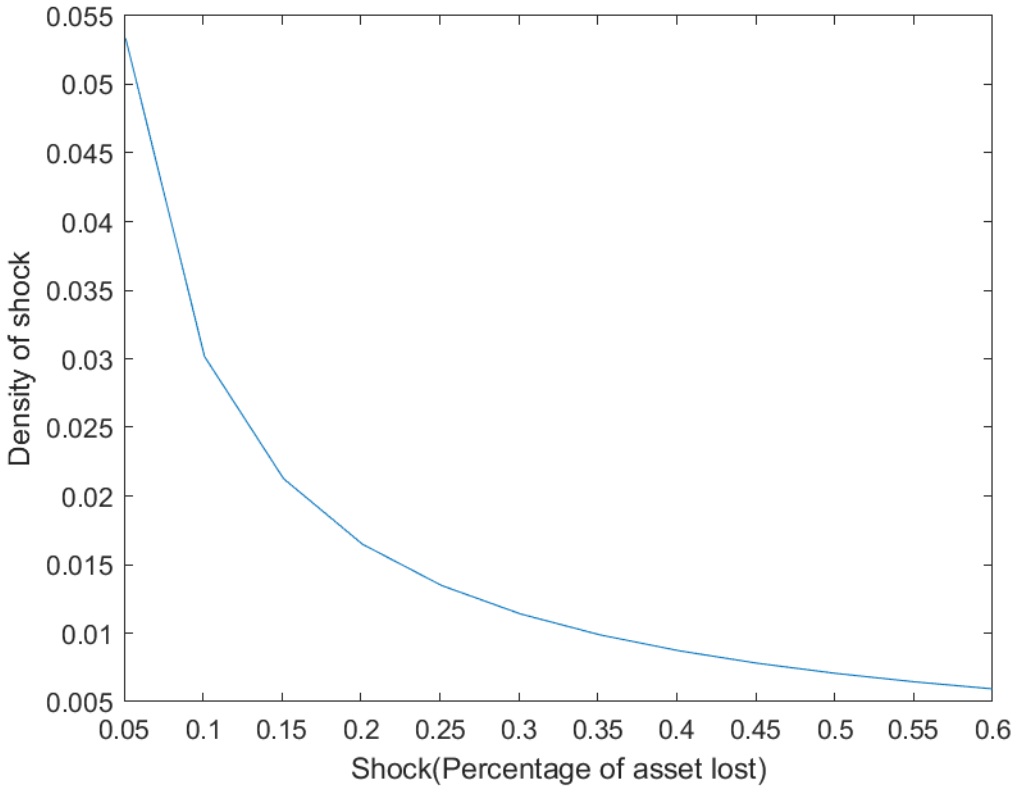
2.A Shock structure and model parameters

Production parameters	Utility function and parameters	Poverty line and transfers
$\gamma^h = 0.56$	$u(c_{it}) = \frac{c_{it}^{1-\rho}-1}{1-\rho}$	$\underline{A} = 7$
$F = 2.95$	$\beta = 0.95$	$\underline{P} = 0.06$
$\gamma^{=}0.28$	$\rho = 1.5$	

Figure 2.A.1: Density covariate shock



The probability of observing no shock (0 loss) is equal to 0.81. We assume a discretized lognormal distribution with $\mu = 0$ and $\sigma = 4$

Chapter 3

Differences in the impact of a coaching intervention between male and female-headed households in the context of a poverty graduation program

Juan Sebastian Correa

n this paper, we explore if a coaching module that aims at fostering an increased sense of agency embedded in a graduation program affects differently male and female-headed households by analyzing its effects on two sets of variables: one reflecting psychological assets of the household head and the other one a series of agricultural practices. We exploit the design of the program where a subset of households is offered the complete graduation intervention, including the coaching module, while another subset is not offered this intervention, to quantify if the coaching component affects the two types of households differently. We find that the coaching component does appear to increase more certain psychological variables for female household heads relative to the male household heads, but this difference is not statistically significant. We additionally find that female-headed

households are more likely to grow vegetables, prepare and use organic fertilizer, and cultivate pastures as a consequence of participating in the coaching program relative to male-headed households, although the effect is only significant for the first variable, and marginally significant for the second. These results suggest that coaching may be operating differently for both types of households, and that the observed differences in agricultural practices could be potentially explained by changes in the psychological assets. Our conclusions are limited due to the small number of female-headed households resulting in low statistical power to detect an effect.

3.1 Introduction

Graduation-type programs target ultra-poor rural households with the aim of providing a big push out of poverty and setting them on a productive path. The results of these programs have proven to be impressive across multiple contexts (Banerjee et al. 2015; Bandiera et al. 2017; Arguelles et al. 2019) and effects have been shown to persist even ten years after the intervention (Banerjee et al. 2020). Moreover, the results of the program have been reported to be highly heterogeneous and households at the top of the conditional distribution of productive outcomes are reported to benefit considerably more from the intervention than those at the bottom (Banerjee et al. 2015; Bandiera et al. 2017). In the second chapter of this dissertation we explore how shock exposure and initial levels of psychological assets of the household head may partially explain these differentiated effects. There is reason to believe that a series of other initial characteristics may very well dictate the performance of households that are beneficiaries of the intervention. Households with more assets may utilize better the resources the program transfers, or households with members with more years of education may get a better grasp of the training the intervention offers, which would then generate larger program returns. But since the program targets the ultra-poor, the expected variation in household characteristics is not big, and program implementers do not consider these differences in their targeting nor in how the program is rolled-out.

Nevertheless, the sex of the household head of beneficiary households is one characteristic that may determine vastly the program results and that is rarely considered a defining feature that merits special attention in graduation-type programs. There are programs of this type that are targeted to females (Bandiera et al. 2017), but the majority are not[1], including Peru's *Haku Wiñay* (HW). In this chapter, we focus on a particular component of the graduation program — the coaching module — and test if it differentially affects a set of psychological variables that measure agency and hope for the head of the household and another set that reflect the adoption of agricultural practices promoted by HW for a

[1] Out of the 6 interventions reported by Banerjee et al. (2015) only one targets women, and none include an explicit gender focus.

sample belonging to the 2017 cohort of beneficiaries. As described in detail in Chapter 1, we have two waves of data collection (baseline and midline) to do this analysis. Moreover, the coaching is an ancillary intervention that only a subgroup of HW beneficiaries are randomized into. This program aims at fostering self-awareness and the recognition of the surrounding environmental conditions so that each person can fully grasp how they perceive themselves and in which context they are situated. It also encourages participants to develop a plan to achieve a productive goal to accomplish on a set time frame. In a nutshell, as this is laid out in detail in Chapter 1, we expect this intervention to positively affect the set of psychological variables that we measure. At the same time, this program may also generate behavioral changes in economic activities since it may motivate individuals to take full advantage of the transfers being made by the program. We are not able to test the effect on income because the data which we are using to run this analysis was collected right after the coaching intervention finished, implying that coaching would not have affected the decision-making process associated to this outcome. Nevertheless, coaching may have influenced certain agricultural practices for which HW provided training and inputs. This paper studies whether this component affects differently these two sets of variables for female and male household heads and their respective households.

In particular, we consider that given that female-headed households (FHH) may face harsher economic realities than male-headed households (MHH) and females face gender norms that are more stringent, FHHs would benefit more from the coaching component relative to MHHs in the context of the graduation program. Moreover, this additional intervention was modestly fine-tuned to speak to the needs of women in order to make them feel more comfortable about discussing topics related to self-perception and future-related objectives, although the curriculum was exactly the same for all participating households. Contrary to female household heads (shortened to females from now on), we hypothesize that male household heads (shortened to males from now on) are already better equipped in psychological terms and the ancillary coaching intervention may have little effect on this population. We find this theory to be partially true since indeed for

the four psychological variables, males appear to be initially in a better position relative to females, although the equality of the two distributions is only rejected for two of the variables. Additionally, for three out of four psychological variables, females have lager values relative to males as a consequence of coaching, although the differences are not statistically significant. We expect a similar result for the adoption of agricultural practices: females may be further motivated by the program than males. Again we find that for three out of four measured agricultural practices the effect is larger for FHHs. One is significant by conventional standards and the other is marginally significant.

There is some evidence regarding the differentiated effects when comparing these two types of households. The rest of the paper is organized as follows. Section 3.2 expands on the program, the measured variables, the observed differences between females and males, and FHHs and MHHs in our sample and briefly describes our theory of change. Section 3.3 shows the results for the effects of coaching on the psychological variables, Section 3.4 shows the results for the effects of coaching on the adoption of agricultural practices, and Section 3.5 concludes.

3.2 Differences between female and male headed households

Table 3.2.1: *Distribution of males and females across study sample.*

	Male	Female	Total
Household head	81.5%	18.5%	784
Participates the most in HW, including controls[1]	51%	49%	745
Participates the most in HW	57.8%	42.2%	512
Participates in coaching	49.2%	50.8%	126

[1] The control group was asked to answer a hypothetical question regarding their interest in participating on a program similar to HW and if interested, which person in the household would be the most likely to participate.

We first look at psychological differences between males and females at baseline. We measured two concepts used in the literature — locus of control and hope — to test whether these are relevant to the success of graduation type interventions. Chapter 1 of this dissertation expands on both of these notions, in the logic behind measuring precisely these two variables, and the types of questions used to measure them. In summary, locus of control measures the degree to which people believe they can control the events that affect their lives. To measure this concept, we used the Levenson (1981) I-P-C (internality-chance-powerful others) scale, which is commonly used in the literature. This scale measures one index for each internality, chance and powerful others. The internality scale measures the extent to which a person believes they can control their own lives. Contrary to internality, the chance scale measures the perception of chance and random events being in control of someone's life. The powerful others scale measures the belief that life is predictable essentially because it is dominated by powerful third parties (leaders local, government, some god, etc) which limits actions that can be taken to change the course of one's life.

Additionally, the measure used for quantifying hope comes from Lybbert and Wydick (2018). This measure of hope is *aspirational*, in the sense that the individual actively seeks positive changes, and the envisioning of being able to achieve such changes comes from a strong sense of agency. The hope measure is made up of 3 separate indices that we combine into one: aspirations, agency and pathways. Agency or self-efficacy, is the belief of being able to achieve specific goals, and pathways refers to the individual's ability to seek solutions to the problems that they may face when they want to meet a certain goal. We follow Anderson (2008) on his approach to create a summary index from a set of multiple outcomes. This measure is also standardized. Higher values of the index indicate higher hope levels. Chapter 1 shows the complete set of questions asked to measure this variable.

Figure 3.2.1 shows the CDF functions for males and females for each of the four psychological variables (internality, chance, powerful other, and hope) measured in our study.

For locus of control, higher values for each of the three variables implies a more *internal* locus of control, meaning that a person has a stronger belief in them being in control of their lives, as compared to having a *external* locus of control, which gives more weight to external factors controlling life outcomes. The first row in Table 3.2.1 shows the number of males and females that are household heads and that are represented in Figure 3.2.1. It is not surprising the strong imbalance favoring male households members self-identifying as the household heads.

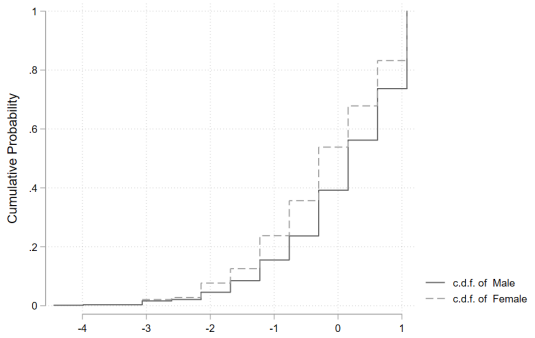
The figures reveal that the distributions for males appear to first-order stochastically dominate the female distributions. This implies that the male distribution for each one of the variables is shifted to the right relative to that of females, meaning that males have higher average values of these variables relative to females. A Kolmogorov-Smirnov test of equality of distributions for males and females reveals that the null hypothesis is rejected at a 5% significance level for internality and hope —Figures 3.2.1a and 3.2.1d —a confirm that at least for these two variables, males have higher psychological assets than females.

One possible explanation for this fact can be related to how poverty and adverse situations have been shown to affect psychological wellbeing and the perception of one's agency, and how these situations may instill hopelessness about the future (Lybbert and Wydick 2018; Wuepper and Lybbert 2017; de Quidt and Haushofer 2016; Moya and Carter 2019). Female household heads, and in particular those living in rural contexts, have been usually found to be face harsher economic realities than their male counterparts in addition to more limiting gender norms that may affect their self-confidence. This is accentuated by the fact that they are also more time-poor than men, since they also have to do household chores and care work, which may manifest in a further decreased sense of agency. These combination of factors may explain these observed initial differences. Nevertheless, there could be other explanations at play, and a deeper dive into economic and gender dynamics could enrich much more the understanding of these differences. Such analysis falls beyond the scope of this paper.

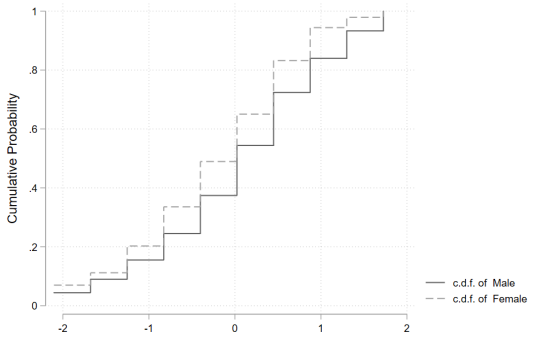
Table 3.2.2 shows how MHHs and FHHs compare in a series of socio-economic character-

Figure 3.2.1: CDFs for initial (pre-treatment) psychological variables, male and female household heads

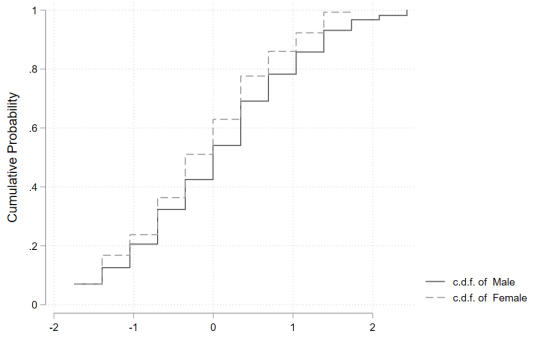
(a) Internality



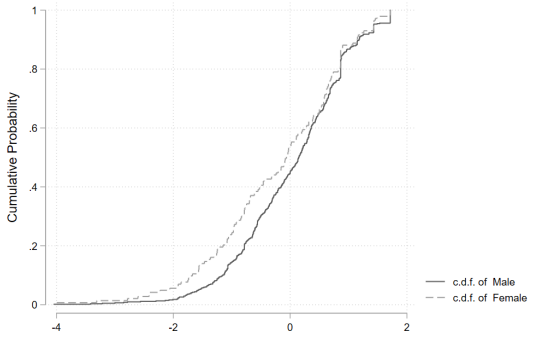
(b) Chance



(c) Powerful others



(d) Hope



istics and one variable that reflects agricultural practices. FHHs are indeed poorer than male-headed ones as measured by annual income. They also are less educated by almost two years. These households also hold less land and the household heads are younger, although these differences are not statistically significant. FHHs are also smaller compared to MHHs, which may be an indication that where females self-report to be the head of the household, there is no male counterpart[2].

In this context, beyond the aggregate effect of the ancillary coaching intervention, one

[2]Anecdotal evidence from the fieldwork reveals that even if the male household member was no longer the main provider, or if he was most of the time away of the main residence, the female counterparts usually listed the males as the head of the household, even though she would be the main decision-maker. This fact may be decreasing the observed differences reported in initial characteristics between MHHs and FHHs

may expect differentiated results for FHHs relative to MHHs. As noted in Chapter 1, a way to think about these psychological assets is as a type of total factor productivity in a simple production function of the type $y = \alpha f(k)$. $f(k)$ is the production function that depends only on capital and α is the "psychological total factor productivity". Moreover we consider that $\alpha = \gamma\phi$, where ϕ is the true productivity. We only consider situations in which $\gamma < 1$ as there is no evidence of overconfidence being prevalent among poor individuals. Hence, if we assume that at most what interventions can do is increase γ for it to be as close to 1 as possible, those with higher initial levels of theses assets will respond less to the intervention. In the next section we explore this possibility.

Table 3.2.2: *Baseline balance, male and female headed households*

	Male	Female	Diff (2-1)
Socio-economic char.			
Income, BL	3377.63	2810.39	-567.24*
Plot size (ha)	2.14	1.91	-0.23
HH head eaducation	6.68	4.83	-1.85***
HH head age	41.86	40.52	-1.33
HH size	4.60	4.08	-0.52***
Technology			
Has used fertilizer	0.79	0.73	-0.06
N	612	143	

Standard errors clustered at a village level.

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

3.3 Effect of the interventions on psychological assets.

We analyze the effect of the HW intervention and the coaching pilot on the 2017 cohort of the HW program. Although HW does not intend to address the psychological wellbeing of the participants, practitioners have highlighted the hand-holding element of the program to generate unintended benefits to beneficiaries in the form of increased commitment to the program and motivation, which may manifest in some of the variables we measure.

Chapter 1 describes in detailed manner how the coaching program may affect the psychological variables. It is worth noting that all the "facilitators" who were in charge of the implementation of the coaching curriculum, had a few sessions in their training related to gender issues, where the importance of not crossing personal boundaries was highlighted and on how to approach sensitive issues if these were brought up. Whenever it was possible, coached females were paired with female facilitators.

Chapter 1 also carefully describes how the sample was selected. In a nutshell, in order for a village to be eligible to receive HW, at least 60% of the population had to have at least one NBI (unmet basic need), which is an index widely used in Latin America to identify critical deficiencies on a given population in order to characterize poverty. Villages had to meet additional requirements regarding size, poverty of the district that they belonged to, and had to be mostly comprised of subsistence farmers to be eligible for treatment. For our sample we kept villages that belonged to districts where at least one village selected to be intervened had 60% to 70% of their population with at least one NBI, and at least one village with 50% to 60% their population with at least one NBI. We exploit the discontinuous jump in treatment assignment at the 60% threshold to identify the effect of HW. Moreover, among those villages selected for treatment and that were actually treated, we randomized some of them to the additional coaching intervention. We ended up with 24 villages to the left of the threshold that are our ITT (Intention to treat) control group that were not initially assigned to receive HW and 29 villages to the right of the threshold that were eligible for treatment and that we will refer to as our ITT treatment group. 26 villages out of the 29 ended up being treated and we randomly assigned 16 of these villages to the additional coaching. This implies that these 16 villages received both H and coaching, while the other 13 only received HW. Chapter 1 also shows the balance tables for these samples, revealing that there are no major differences between the subsamples.

The HW program is open to any interested villager. When a household joins the program it receives a series of trainings and in-kind transfers including animals, seeds, and

other inputs. The program has 7 modules[3] for which it offers trainings and requires the engagement of at least one family member. Hence, it is not required that the head of the household participates in all of the modules. These activities usually involve other family members, particularly the spouses of the male household heads. It may even be the case that the household head is not involved at all in any of the activities of HW.

In order to capture the effect of the programs, we estimate the following model by OLS:

$$P_{i,v,1} = \alpha_0 + \tau_0 HW_v + \beta \tilde{X}_v + \gamma HW_v \tilde{X}_v + \tau_1 HW_v C_{i,v} + \varrho_{i,v,0}\delta + \varepsilon_i \tag{3.1}$$

where $P_{i,v,1}$ represents either of the psychological assets of household i in village v in period 1. HW_v is a dummy variable equal to 1 if village v is to the right of the threshold of the running variable making the village eligible for treatment and 0 otherwise, and $\tilde{X}_v$ is the running variable (percentage of households with at least one NBI) centered around 0. Additionally, the fifth term is the interaction between being to the right of the threshold, and a variable $C_{i,v}$ representing whether household i was selected for coaching in village v. We also include $\varrho_{i,v,0}$ which is a vector of control variables for household i in village v. It is also possible for a household to belong to a village where coaching was offered and where coaching was not offered to them. We refer to this type of household as the spillover group. We account for this effect in the regression but we do not analyze it. In the vector of additional controls we include a term that captures the effect of the spillover effect. In order to compare the effects of the program between males and female household heads, we run this regression for each of these two groups and compare the coefficients.

To get an unbiased estimate, we restrict our regression to include only HW or would-be HW participants. For those that were not invited to participate in HW, we asked in our midline survey questions regarding their willingness to participate in a program such as HW. We described its characteristics without mentioning the name in order to not create

[3]The modules included the creation or expansion of an orchard, learning how to do organic fertilizer, agroforestry training, techniques to grow grains and tubers, the installation of irrigation, training in the proper management of small animals such as guinea pigs and chickens, and training in how to cultivate and store pastures. All these modules came with transfers.

false expectations about the future offering of the program in control villages. Moreover, since the additional coaching intervention was designed to be offered to the person that participates the most in HW, this implies that not all the household heads of the households selected for coaching are the participants. Unsurprisingly, this is true in particular for MHHs. Virtually all female household heads participated in HW. Nevertheless, the coaching program was intended to be developed among all members of the households. Although there was a main participant, many of the activities that the beneficiaries had to develop included spouses and other family members. Hence, it is possible to think of the psychological variables reflecting a sort of household level psychological status. Moreover, Table 3.3.1 below reveals that there are essentially no differences in the raw psychological variable measures among the households where the household head is not the HW participant, validating our choice of keeping the household head psychological assets as the variables to be analyzed.

Table 3.3.1: *Difference between household head and HW participant, midline*

	Household head	Participant	Diff (2-1)
Internality	25.03	25.53	0.50
Power. oth.	12.59	13.32	0.72
Chance	12.61	12.72	0.11
Hope	0.11	0.11	0.00

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 3.3.2 below shows the OLS estimation results for the model presented in Equation 3.1 for the standardized measures of psychological variables at midline. Each column reflects the estimated impacts for male and female household heads for each of the four psychological variables. The table reveals participation in HW has certain positive effects on some of the variables for both females and males: females appear to increase internality while males both hope and powerful others, the latter implying a shift towards a more internal locus of control. But our interest lies primarily on seeing the effects of coaching, since it is through this channel that we would expect to see greater changes in

psychological variables. Most of the effects are positive, except for the chance variable of male household heads. Moreover, the effect on women is larger for three out of the four variables. Nevertheless, given the small number of women that are household heads, the significance tests are underpowered. The gains in both chance and hope coming from coaching are sizable compared to those for males, although they are not significantly different from each other. A larger sample may have yielded more precise estimated effects, but our sample size was set and budget considerations did not allow to expand the sample. The direction of the coefficients point towards a positive effect of coaching on such variables.

Table 3.3.2: *Average impact of HW and coaching on psychological variables, household heads*

	Internality		Chance		Powerful others		Hope	
	Male	Female	Male	Female	Male	Female	Male	Female
HW	-0.04	0.43**	0.10	-0.02	0.25*	-0.19	0.33***	0.13
	(0.10)	(0.25)	(0.17)	(0.33)	(0.15)	(0.40)	(0.09)	(0.59)
Coaching	0.21	0.24	-0.10	0.21	0.27**	0.20	0.01	0.25
	(0.15)	(0.28)	(0.15)	(0.25)	(0.13)	(0.29)	(0.09)	(0.39)
R^2	0.13	0.42	0.15	0.32	0.18	0.23	0.13	0.36
N	519	116	519	116	519	116	519	116
Mean Control	0.02	-0.30	-0.05	-0.31	-0.26	-0.23	-0.07	-0.24

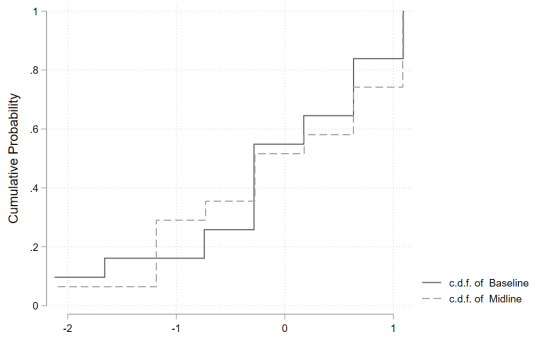
Standard errors clustered at a village level in parenthesis. All models include fixed effects per district. Included baseline controls are land size, household size, years of education of the household head, age of the household head, if the household head has ever used fertilizers of any kind, sex HW participant and baseline annual income. Also, baseline levels for each psychological variable.

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

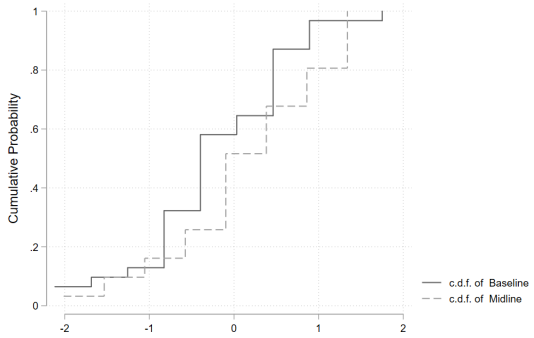
Another piece of evidence that shows that FHHs benefited in terms of increasing their psychological assets is presented in Figure 3.3.1. This figure shows for each of the psychological variables the CDF function before and after the intervention for FHHs that were offered the coaching intervention. It is clear that for both chance and powerful others,

Figure 3.3.1: CDFs for final psychological variables, before and after intervention, female household heads

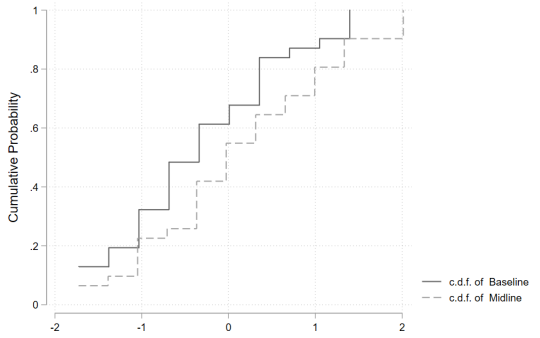
(a) Internality



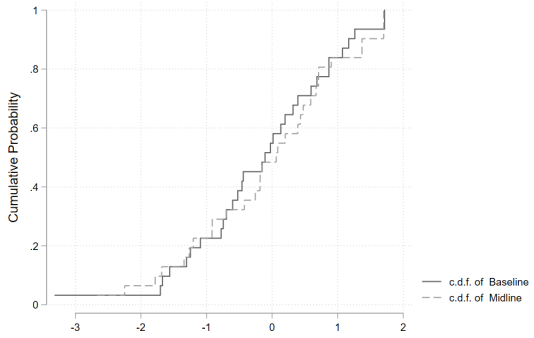
(b) Chance



(c) Powerful others



(d) Hope



this before-after comparison reveals that there were was a positive effect of participating in both HW and the coaching intervention. For hope the effect is less clear, while for internality the picture is not illustrative. Nevertheless, a Kolmogorov-Smirnov test on the equality of the distributions is not rejected for any of the variables. As with the previous table, the low number of FHHs may be a potential reason as to why these positive effects are not confirmed by formal tests.

3.4 Adoption of farming practices

The main goal of including the coaching intervention is to assess the importance of the coaching component in graduation type programs. Our theory of change suggests that if coaching is indeed a relevant component of these interventions, we would expect it to

have an effect on psychological assets and these would generate increased effects on the variables that we use to measure wellbeing. Nevertheless, the timeline of our midline survey prevents us from fully evaluating the effect on outcomes such as income, since the survey captures agricultural income — which constitutes the largest share of the household's income — associated to harvests that took place before the coaching component was rolled out. Given this limitation, what we can explore with the midline data is the effect coaching has had on a series of agricultural practices that are encouraged by HW and that may directly influence agricultural income and other outcomes such as food security in the following seasons.

We estimate again the model laid out in Equation 3.1 but considering as outcomes the following four agricultural practices: i) the preparation and usage of organic fertilizer, ii) the planting of vegetables, iii) growing seedlings in trays and, iv) cultivating pastures. These four activities are encouraged by HW and the timing of the midline survey allows us to measure whether the participation in the coaching component had a direct additional effect on the adoption of these practices. We expect that if coaching is to be successful, beneficiaries must change behaviors and adopt beneficial agricultural practices, in particular those that HW has promoted and for which it has transferred inputs and knowledge.

Table 3.4.1: *Baseline practices, MHHs vs FHHs*

	MHHs	MHHs	Diff (2-1)
Uses organic fertilizer	0.08	0.02	-0.07***
Grows vegetables	0.16	0.12	-0.04
Cultivates pastures	0.45	0.35	-0.10**

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

In this section we test whether MHHs behave differently in terms of the adoption of such practices relative to FHHs. Table 3.4.1 shows the baseline differences for three of the practices. Unfortunately we do not have a baseline measure for the transplanting seedlings

practice. The table shows that the baseline measures for the use of organic fertilizer and the cultivation of pastures is higher for MHHs than for FHHs. Still,the differences are not very big and the use of these practices is not widespread, in particular for fertilizer use and the growing of vegetables.

Table 3.4.2 shows the results for the OLS regression of the model expressed in Equation 3.1 but using the four practices described above as outcomes, and controlling for their baseline levels. Again, we run the model separately for MHHs and FHHs and test the null hypothesis of the equality of τ_1 for both types of households.

The table shows that beyond several positive effects of HW on these variables, coaching also appears to generate some positive impacts. The coaching effect is positive for all the outcomes except for the transplant of seedlings where it is negative but very close to zero. Moreover, only the effect on the growing of vegetables is statistically significant. The effect on the preparation and use of organic fertilizer is just shy of being significant at a 10% significance level. As with the previous regressions, the estimated effects are not precise enough. It is striking that the effect of coaching is considerably larger for women in 3 out of 4 outcomes relative to the estimated effect for men. A Wald test for the equality of the coefficients for MHHs and FHHs for the planting of vegetables is rejected at a 5% significance level, while for the rest of the outcomes the equality can not be rejected. The p-value for the test for the preparation and use of organic fertilizer outcome is 0.11, making the difference almost significant. This is a particularly interesting effect. At baseline both types of households planted vegetables at the same rate. Moreover, HW significantly affects the rate at which MHHs plant vegetables, while the effect for FHHs is not significant. The coaching curriculum did not mention any of the HW activities. Hence, it must be the case that something about this training made FHHs more prone to adopting these practices.

As explained earlier, it is the case that some of the household members receiving the coaching are not necessarily the household heads. This is true for the MHHs, which implies that some of the participants will be the spouses. This means that if anything, the

observed effects on MHHs would be biased upwards if the observed results are associated to females being able to make better use of the coaching resources. If this is the case, the differences between MHHs and FHHs could larger than what is presented in the table.

Table 3.4.2: *Adoption of farming practices, HW beneficiaries*

	Organic fert.		Vegetables		Transplants seedlings		Pastures	
	Male	Female	Male	Female	Male	Female	Male	Female
HW	0.33***	0.39**	0.19***	0.16	0.01	0.24	0.14**	0.20
	(0.07)	(0.17)	(0.07)	(0.18)	(0.05)	(0.15)	(0.07)	(0.17)
Coaching	0.03	0.22**	-0.06	0.18	-0.04	-0.05	0.03	0.16
	(0.06)	(0.11)	(0.06)	(0.11)	(0.04)	(0.10)	(0.06)	(0.10)
R^2	0.23	0.41	0.13	0.28	0.38	0.38	0.31	0.48
N	518	116	518	116	518	116	518	116
Mean Control	0.16	0.14	0.68	0.52	0.25	0.23	0.40	0.50

Outcome variable in first two colums is whether the household prepared and used organic fertilizer in the past year. Outcome variable in columns 3 and 4 is whether the household has planted any vegetables in the past year. Outcome variable in columns 5 and 6 is whether the households transplant vegetable seedlings. Outcome in columns 7 and 8 is whether the households cultivates pastures. Standard errors clustered at a village level in parenthesis. All models include fixed effects per district. Included baseline controls are land size, household size, years of education of the household head, age of the household head, if the household head has ever used fertilizers of any kind, sex of the hw participant or would-be participant and baseline annual income. Also, baseline levels for each psychological characteristic.

$^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

3.5 Conclusions

In this paper we compare the effects of the coaching component on the psychological variables of female and male household heads and on the farming practices of both MHHs and FHHs. Our theory of change suggests that female household heads and their households should benefit more from the coaching intervention given their low level of psychological assets at baseline. This should manifest in both increased psychological assets at midline and a higher rate of adoption of agricultural practices. We find partial evidence support-

ing this hypothesis since the estimated effects for both the psychological and agricultural practices are not precise enough. The low number of FHHs could explain the imprecise estimate effects. Nevertheless, we will have more data coming in from the endline survey soon which may help refine these estimates.

Our results suggest that in the context of a program that is transferring a significant amount of assets and offering trainings and advice on agricultural practices, an intervention that addresses psychological barriers may serve as a catalyst for better results, in particular for those that may initially lack in motivation, sense of agency or hope, as we have shown it was the case for FHHs. It may happen that these interventions do little for those that already have a good foundation of these assets. It remains to be seen with the endline data how this translates to measures of economic wellbeing such as income, and also, if this additional intervention is cost-effective, given that it appears to only benefit a subset of the participants.

At the same time, our results highlight the importance of accounting for defining characteristics when analyzing the effects of poverty graduation programs. Restricting this to adding a control variable may leave out a series of important insights that may help understand not only the size of the effects, but also potential sources of heterogeneity. Nevertheless, expanding the analysis to be able to capture these differences comes at an increase cost for the researcher, since in order to get precise estimates larger samples may be warranted.

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