

NBER WORKING PAPER SERIES

MAKING ENTREPRENEURS:
LONG TERM RETURNS TO TRAINING YOUTH IN BUSINESS SKILLS

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Working Paper 34637
<http://www.nber.org/papers/w34637>

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
January 2026

We gratefully acknowledge financial support from Centre of Excellence for Development Impact and Learning, supported by UKaid, ILO, Jacobs Foundation, IPA Research Methods Initiative, and IPA Entrepreneurship and Private Sector Development Program, JPAL PPE program, USAID, and Wellspring Philanthropic Fund. We are also grateful to Fernando Saltiel, David McKenzie, Susana Puerto, Natalia Rigol, Sharique Hasan as well as seminar and conference participants at UC Berkeley, BREAD-Africa, Bocconi, BSE, LSE, the World Bank, IADB, RIDGE, HEC Paris, NBER Summer Institute, Northwestern University, and USC. We express our gratitude to IPA and to the data collection team: Bonny Ndung'u, Alex Mwesigwa, and Nathan Kalungi. Piero Zanocco and Angela de Santis provided excellent research assistance. We are especially grateful to Piero Zanocco for his exceptional contributions. We are thankful to all the RAs who supported the project implementation and data collections: Kyonne-Joy Grant Isaac, Ada Kwan, Em Reit, Aisling Scott, Pooja Suri, and Jerry Zhu. We gratefully acknowledge Nathan Fiala's contributions to early stages of the design and baseline survey instruments. The experiment in this paper is registered at the AEA RCT Registry (code: AEARCTR-0000550) and the Uganda National Council of Science and Technology (UNCST, SS 2722). The protocol was granted IRB approval by the IPA Institutional Review Board (IPA IRB, 556 and 15486). The authors declare that they have no financial or material interest in the results discussed in this paper. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 34637
January 2026
JEL No. C93, I20, J23, J24, M13, M53, O15

ABSTRACT

We study the medium and long term impacts of Skills for Effective Entrepreneurship Development (SEED), a 3-week entrepreneurship training program for secondary school students in Uganda. The mini-MBA, modeled after business school curricula, was implemented as a randomized field experiment with a nationally representative sample of 4,402 youth. After four years, the training improved both hard and soft skills. SEED graduates became more effective negotiators and communicators and exhibited improved self-efficacy, stability, plasticity, and stress management. In the medium run, treated youth were more likely to start enterprises and more successful in ensuring their survival, thereby gaining greater entrepreneurial experience. Their ventures were also of higher quality: more likely to be formal, have employees, be in collaboration with other entrepreneurs, and use effective business management practices. With 52% of the sample still enrolled in post-secondary education, we find suggestive evidence that businesses led by the treatment groups performed better. After nine years, business ownership converged between treatment and control groups as control ownership rates doubled. However, SEED graduates maintained their edge in terms of business quality and operated firms with 20% higher revenues and 16% higher profits, without corresponding increases in capital or labor inputs, consistent with higher total factor productivity. Entrepreneurial success was achieved through the adoption of better business practices and experimentation, with soft skills related to entrepreneurial mindset playing a complementary role. SEED generated high returns on investment: the present discounted values of SEED-induced business and total earnings equal 20 and 27 times program costs, respectively.

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AEA randomized controlled trials registry entry is available at
<https://www.socialscienceregistry.org/trials/550>
Also registered at Uganda National Council of Science and Technology (UNCST, SS 2722)

1 Introduction

Unlocking the “production function” of high-quality entrepreneurs is thought to be an important catalyst to solve several economic challenges. Entrepreneurship has long been recognized as a powerful engine of economic growth (e.g., [Smith, 1776](#)). Entrepreneurs invest in risky ventures in the hope of high returns, introduce new and innovative goods and services, and improve production processes ([Schumpeter, 1911](#)). The demand for quality entrepreneurs has led governments to invest heavily in programs to increase the stocks of entrepreneurial skills ([Deming, 2017](#); [OECD, 2015](#)), with the developing world alone spending more than US\$ 1 billion annually on entrepreneurship training ([McKenzie et al., 2023](#)).

The supply of skilled entrepreneurs is particularly important in low- and middle-income countries, where labor markets are characterized by low levels of wage employment and high rates of self-employment, with workers often favoring self-employment or unemployment over available wage opportunities ([Breza and Kaur, 2025](#); [Bandiera et al., 2022](#)). In Africa, small and medium enterprises (SMEs), represent 90% of private sector businesses and generate 80% of job opportunities ([International Trade Centre, 2018](#); [Runde et al., 2021](#); [Raia, 2024](#)).¹ The African workforce is expected to grow by 910 million people by 2050 ([Mpemba and Munyati, 2023](#)) creating enormous pressure on SMEs for jobs. Against this backdrop, the stakes for producing high-quality entrepreneurs are high, as the overwhelming majority of small business owners are necessity entrepreneurs who lack attractive alternative opportunities ([Schoar, 2010](#)).

To assess the degree to which successful entrepreneurs can be “made”, we designed an intervention called Skills for Effective Entrepreneurship Development (SEED) in Uganda. SEED is an innovative full-time, in residence, 3-week mini-MBA program modeled after business school curricula, adapted to the Ugandan context. SEED was implemented as an at-scale randomized controlled trial (RCT) featuring a nationally representative sample of students in their last year of secondary school. Study participants were surveyed before the intervention (baseline), and four (medium run) and nine years (long run) after training to assess program impacts.

SEED was designed to teach modern management practices and foster transformational entrepreneurial skills. It included extensive material on best-practice business management such as sales, suppliers, inventory, finance, competition, human resources, goal setting, and use of technology. These tools have been shown to be central in driving firm performance ([Bloom and Van Reenen, 2007](#); [Bloom and Reenen, 2010](#); [Bloom et al., 2020](#); [Iacovone et al., 2022](#); [McKenzie, 2021](#)). Recent evidence suggests that transformational and subsistence entrepreneurs are quite different,² not only in terms of their economic objectives, but also with respect to motivation and personality characteristics ([Schoar, 2010](#)).³ Transformational entrepreneurs tend to have greater confidence, ambition,

¹Worldwide, SMEs represent approximately 90% of businesses and generate more than 50% of employment ([World Bank](#)).

²Subsistence entrepreneurs tend to prioritize household income stabilization and the survival of small, needs-oriented enterprises with less emphasis on innovation or firm expansion ([de Mel et al., 2009](#); [Schoar, 2010](#)).

³The same soft skills have also been shown to be important in the context of more general labor market outcomes. See, for example, [Borghans et al. \(2014\)](#); [Deming \(2017\)](#); [Deming and Kahn \(2018\)](#); [Deming and Silliman \(2024\)](#);

motivation, and expectations for their businesses (de Mel et al., 2013; Ardagna and Lusardi, 2010), with inter- and intra-personal skills playing a critical role in their success (Lucas, 1978; Baumol, 1996; Murphy et al., 1991; Gennaioli et al., 2013; Levine and Rubinstein, 2017).

Unlike traditional entrepreneurship training programs, SEED does not focus on existing business owners, but instead enrolls potential future entrepreneurs. SEED targets young people at the end of secondary school, which is much earlier in life than traditional entrepreneurial interventions, and before they begin their working lives. In addition, the period from adolescence to the mid-20s is characterized by significant development of high-level cognitive processes. These include executive and social cognitive processes responsible for emotion regulation, working memory, inhibitory control, abstract thought, decision making, perspective taking, and interpersonal communication (e.g., Blakemore and Robbins, 2012; Dumontheil, 2014; Sebastian et al., 2010; Andrews et al., 2021; Choudhury et al., 2006; Tousignant et al., 2017).⁴ This developmental phase represents a transformative period of heightened neuroplasticity that can shape youth’s futures and set them on higher trajectories of lifetime productivity.

The study featured two separate treatment arms: (1) a hard skills curriculum that placed a stronger emphasis on hard skills, with 75% hard skills (e.g., accounting, finance, economics, marketing) and 25% soft skills (e.g., negotiation, persuasion, personal power, team work, emotional regulation); and (2) a soft skills curriculum that had the reverse mix – 25% hard skills and 75% soft skills. In 2012, a sample of 4,402 high school students was recruited from a random sample of 200 high schools from the universe of full-time high schools in Uganda. Study participants (34% female), stratified by gender and secondary school, were randomly assigned to one of the two treatments and to a control group.

At the end of the training, both treatments produced a significant increase in knowledge of both hard and soft skills, as well as a differential accumulation of knowledge consistent with the specialized focus of their randomly assigned curricula. Four years later, SEED graduates outperformed the control group in terms of hard skills and business knowledge, as well as in terms of socio-emotional skills/traits. While hard skills knowledge scores converged between the two treatment groups, the effects on inter- and intrapersonal skills tell a more nuanced story. The gap in *intrapersonal skills* (stability, plasticity, stress, etc.) between treatment groups disappeared, while meaningful differences in negotiation, persuasion, and self-efficacy (defined as the belief in one’s ability to effectively perform tasks needed to achieve a valued goal) continued to favor the SEED soft skills treatment group.

In the medium run, SEED was effective not only in fostering the accumulation of human capital (soft and hard skills), but also in catalyzing self-employment and business creation, with both treatment groups being more likely to have ever established a business than the control group and to

Heckman et al. (2006); Bowles et al. (2001); Autor (2015); Bassi and Nansamba (2022).

⁴Development of these cognitive processes appears to be underpinned by structural and functional brain plasticity. During adolescence to young adulthood, the prefrontal cortex undergoes significant structural changes that entail the proliferation of new synapses and the rewiring of existing connections, particularly between the prefrontal and limbic regions (Ahmed et al., 2015; Blakemore, 2012).

own an active business at the time of the 4-year survey. Overall, SEED graduates started businesses earlier in their lives, started more businesses, and accumulated more experience. However, early onset of (and success with) entrepreneurship did not discourage youth from pursuing post-secondary education relative to the control, with roughly half of the study sample still being enrolled in post-secondary at the time of the 4-year survey. Self-employment grew significantly between the 4- and 9-year follow-ups, doubling in the control group from 27% after 4 years to 58% five years later. After nine years, the self-employment gap had closed between the treatment and control groups. The high prevalence of business ownership in the sample speaks to the prominent role that self-employment plays in sub-Saharan African economies.

However, there were important differences in business quality in both the medium and long runs. Businesses in the treatment group were more likely to be formal, have partners, and adopt better management practices compared to the control group. In the long run (9 years), SEED firms operated on a larger scale, generating higher revenues (20%) and profits (16%) through more productive use of similar levels of capital and labor inputs as control firms. These efficiency gains emerged in the context of improved management practices, consistent with the idea proposed by [Bloom et al. \(2017\)](#) and [Bloom and Van Reenen \(2007\)](#) that the adoption of better management practices is akin to investments in “technology” that raise total factor productivity (TFP).

The better performance of the treatment groups could have been driven not only by improved management practices, but also by SEED’s role in fostering an earlier onset of youth’s economic lives. Earlier business starts could have allowed for more (business) experimentation, including optimal quitting and pivoting strategies ([Yu, 2020](#); [Lee et al., 2024](#)), which, in turn, could have led to better firm outcomes in the long run.

To test these hypotheses, we employ mediation analysis to assess the extent to which management practices, business experience, and soft skills or personality traits mediate the long run effects of training on business earnings and on business practices. Indeed, business experience and management practices emerge as statistically significant mechanisms, contributing to a substantial portion of the 9-year business earnings effect (their indirect effects accounts for 68.8% and 43.6% of the total effect, respectively).⁵ Among soft skills, only plasticity (a proxy of entrepreneurial mindset) has a statistically significant indirect effect. Its contribution to the total effect is modest (16.2%).

The mediation results for 9-year managerial practices show a different pattern. Indirect effects for all combined mechanisms are modest (at most 29.9%), suggesting that SEED training affects managerial practices primarily through its direct effects rather than through these mediating mechanisms. In particular, the indirect effect of business experience is small and weakly robust, indicating that the long run adoption of improved managerial practices is not primarily acquired through business experience or experimentation.

These results suggest a nuanced re-framing of the notion that entrepreneurship is a process

⁵Causal mediation analysis rests on strong identifying assumptions such as sequential ignorability of the outcome and mediator. As such, we also assess the robustness of the mediator following [Imai et al. \(2010,?\)](#).

of trial-and-error and learning-by-doing.⁶ In particular, mediation results offer insight into the production function of successful businesses, bridging the managerial practices and soft skills literatures. Business experimentation alone does not enable entrepreneurs to converge to efficient business practices that are essential for SME success. The ability to learn effectively and acquire the right skills and the right knowledge is also paramount (Lafontaine and Shaw, 2016; Thompson, 2010; Rosen, 1972). SEED appears to have endowed youth with better knowledge, better know-how of business practices, and promoted a more entrepreneurial mindset (as proxied by plasticity), allowing participants to take advantage of the extra experience from earlier business starts.

The experience and quality of SEED peers (measured before training) had no meaningful effect on long term outcomes. We also find limited scope for school- or geography-based networks, suggesting peer dynamics could not be important enough to drive these results. These findings challenge the hypothesis that SEED operated primarily as an entrepreneurial hub where interactions among like-minded young entrepreneurs were central to SEED’s success.

SEED training generated substantial returns on investment. The present discounted value of incremental SEED-induced business earnings and total earnings are \$2,892.67 and \$3,882.57,⁷ respectively, under the conservative assumption that no impacts emerged until year four, that impacts grew at a constant rate between years four and nine, and that impacts remain constant from year nine to 15 and are zero thereafter. At a program cost of \$143.13 per youth, the estimated returns on investment are 20-fold for business earnings and 27-fold for total earnings.

Our paper stands in contrast with the large body of work on the effectiveness of business training interventions in improving the performance of managers of existing enterprises. Despite their popularity, reviews of these programs document relatively weak or temporary impacts in low-income settings (Blattman and Ralston, 2015; McKenzie and Woodruff, 2017; Card et al., 2018). A more recent meta-analysis by McKenzie (2021) concludes that traditional entrepreneurship training for microenterprises has modest but significant (across studies) effects in terms of improving business practices and business outcomes. The most compelling evidence relates to the training of small-scale subsistence enterprises: successful trainings may lead to short-lived improvements in profits or sales, without altering the growth paths of enterprises.

Fewer resources have been devoted to assessing whether individuals can be taught a more entrepreneurial personality and soft skills (Kerr et al., 2018). Evidence on how to effectively develop these skills is limited (Deming, 2022). A small but growing number of studies considers interventions that teach these attributes to entrepreneurs in developing countries. Programs that foster an entrepreneurial mindset have shown more encouraging results than traditional training. Innovation in the context of training models has proliferated in recent years (McKenzie et al., 2023) and includes personal initiative training (see Campos et al., 2017, 2024; Alibhai et al., 2019; Ubfal et al.,

⁶Manso (2016) documents patterns that are in line with entrepreneurship as experimentation: entrepreneurship spells are short and the probability of abandoning entrepreneurship is higher after poor performance. Kerr et al. (2014) argue that entrepreneurship is fundamentally about experimentation because the knowledge required to be successful cannot be known in advance. These ideas can be traced back to Arrow (1969) and Schumpeter (1911), who link innovation to the production of knowledge through experimentation and creative destruction.

⁷Monetary values are in 2021 USD.

2019, in Togo, Ethiopia, and Jamaica, respectively) and psychology-influenced training curricula, including interpersonal skills (Dammert and Nansamba, 2019; Bossuroy et al., 2022). Efforts to replicate Campos et al. (2017)’s success in Togo – where personal initiative training increased firm profits by 30%, compared to a statistically insignificant 11% increase among those who received traditional training – have produced largely insignificant and therefore less encouraging results in other contexts.

In addition to entrepreneurial mindset, another area of curriculum innovation has explored approaches to cost effectively build managerial capacity for SMEs.⁸ Teaching specific managerial practices such as marketing (Anderson et al., 2018), Kaizen production and quality management (Higuchi et al., 2019), or ways to acquire them in the marketplace (Anderson and McKenzie, 2022) have also shown promise. SEED’s design blends a psychology-informed approach with a strong focus on comprehensive business/managerial practices and step-by-step guidance to translate best practices into actions.

Finally, our work contributes to the literature on the efficacy of entrepreneurship programs targeting youth who are still in school, where the evidence is mixed. Impacts appear to be limited to employment/business creation (see, for instance, Calderone et al. 2023, in Tanzania, and Brudevold-Newman et al. 2024, focusing on young women in Kenya) with largely no or small effects on earnings. A possible delay between training and the onset of economic participation is cited as a reason for the lack of observed effects on earnings. However, the few studies examining the medium and long term effects of youth training programs suggest they may not strengthen, but rather fade as youth age (e.g., Alaref et al. 2020, in Tunisia, and Alzúa et al. 2016, in Argentina). More promising are the findings from interventions supporting school-to-work transitions, the development of sector-specific skills, and work experience. As illustrated by Bandiera et al. (2020) and Alfonsi et al. (2024), skills acquired through vocational and/or firm-sponsored training can yield substantial impacts on outcomes such as employment and wage earnings for young workers, as well as on their job search strategies (Bandiera et al., 2025).

2 The Intervention

The team designed two separate curricula: a mini-MBA with a greater emphasis on hard skills and a mini-MBA with a greater emphasis on soft skills. Both curricula were based on material from the MBA program of the Haas School of Business at UC Berkeley, adapted to the Ugandan context. The hard skills training also integrated content from the International Labor Organization’s “Know About Business for Africa” curriculum.

The SEED curricula were extensively pilot tested to ground them in the local language and cultural environment, make them relevant to local business institutions, and ensure that the course content was appropriate and well understood and that the teaching methods were interesting and

⁸Consulting and managerial interventions have been shown to generate sizable productivity gains in firms in low- and middle-income countries (e.g., Bloom et al., 2013, 2020; Bruhn et al., 2018; Iacovone et al., 2022). However, the costs of such interventions can be prohibitive — between \$10,000 and \$30,000 per firm.

engaging. Lesson plans for the two curricula and the business plan component are summarized in Table 1.

Students in the *hard skills arm* differentially focus on (1) accounting, covering financial statements (income statements and balance sheets), and the cost structure of an enterprise; (2) business creation, covering generating business ideas, selecting a suitable market, resources needed to start an enterprise, and legal forms of business ownership; (3) management, covering sales, keeping track of business operations, hiring and managing people, and selecting suppliers; and (4) finance, covering managing money, investments, and obtaining financing to start a business. The hard skills curriculum provides foundational skills to teach students how to generate a business idea, how to secure capital, how to get the business off the ground, and how to manage it.

Students in the *soft skills arm* differentially focus on inter- and intrapersonal skills. Specific topics include (1) learning to control one’s self through self-management, goal setting, risk taking, decision making and personal power;⁹ (2) persuasion through communication strategies, leadership and team building, group decision making strategies, social networking and public speaking; and (3) negotiation through win-win strategies and personal power. This soft skills curriculum teaches foundational skills so that students have more self-awareness, improved ability to regulate emotions, delay gratification, and make sound decisions.¹⁰

The *business plan curriculum*, available to both treatment groups, outlined fundamental principles that students could use as a guide to develop successful business plans, such as goals, structure, and other aspects of business development. The classes covered key topics in depth, including market research, human resources, legal and tax issues, financial planning, fundraising, and marketing. Two classes were devoted to pitching the business plans, and two others to case studies. The business plan curriculum had the goal of guiding students in developing their own original business plan. The authors of the winning plan at each host school were awarded a cash prize of 1 million Ugandan Shillings, UGX (approximately \$400). One student per site won, for a total of 20 winners.

The curricula were structured to promote participatory classroom environments and to address diverse learning modalities using a range of interactive exercises and pedagogical approaches.¹¹ The intensive 3-week entrepreneurship trainings were organized into 17 sessions and structured lesson plans were developed for each session (see Table 1). Lesson plans included detailed steps for the teacher to follow, framed by objectives and rationales to encourage a sense of ownership by the teacher. The plans covered learning objectives, key concepts, case applications, presentation

⁹Personal power is the ability to ignore the influence of others, to control one’s own outcomes, and to be personally independent (see van Dijke and Poppe, 2006; Galinsky et al., 2008).

¹⁰As noted in the literature, soft skills can serve as a complement to hard skills expertise and can be predictive of both success in the job market and levels of productivity. See, for instance, Heckman and Kautz (2012); Ajayi et al. (2022); Adhvaryu et al. (2023); Brudevold-Newman et al. (2024).

¹¹In the context of the 2016 education reform in Rwanda, Blimpo and Pugatch (2021) experimentally study the extent to which comprehensive teacher training can improve the implementation of the entrepreneurial curriculum for upper secondary grades. The 2016 reform mandated that all secondary students enroll in the revised entrepreneurship course, which, in turn, prevents a direct test of the entrepreneurship curriculum. The more participatory pedagogical style led to increased entrepreneurial activity among students and suggests that substitution between entrepreneurship and wage employment may be at play among students in treated schools.

materials, and a series of interactive exercises. The lesson plans were designed for use in an intense Western-Socratic-based course in which the learning process encourages sharing, discovery, and reflection, while maintaining a similar classroom environment between curricula and across all training sites.¹²

The training took place between May 6th and May 24th, 2013 – for a total of 17 instruction days – at 20 host school training sites, during the break between Term 1 and 2 of the academic year, when dormitories at host schools would be available. Students slept and boarded at the schools, attending two lessons each day: a 2-hour curriculum-specific lesson in the morning and one business plan lesson in the afternoon. Each student also had two “prep” periods per day – one in the morning and one in the afternoon. Students were expected to work on their homework or business plans during these periods, which were supervised by SEED camp directors and teachers. Several monitoring and supervision tools were adopted to assess both operational and academic aspects of the training and to ensure that the training was implemented as designed. Monitoring was used to identify deviations from the curriculum and weak instructional pedagogy by specific teachers and to correct problems in real time.

3 Experimental Design

The study was set up to be nationally representative, with both students and teachers randomly assigned to one of three arms (hard skills, soft skills, and control) and to one of 20 training sites. The study design and study milestones are presented in Figures 1 and A.1, respectively.

3.1 Student Recruitment

To ensure representativeness at the national level, students were recruited from 200 full-time secondary schools randomly selected from the universe of approximately 700 full-time secondary schools in Uganda. In October 2012, promoters visited each of the 200 schools to recruit students in their sixth (last) year of secondary school. Each recruitment visit consisted of an oral presentation and promotional posters. The promotion informed the students of a 3-week in-residence program to train students in entrepreneurship. SEED would be free, including lectures, room and board, and transport, and students would have the opportunity to develop business plans and enter a competition for a large cash prize. The promoters explained that there was limited space in the program, such that not all applicants would be admitted, but that they all had an equal chance of admission through a fair lottery.

Students interested in the program were asked to complete a simple application form and a baseline survey.¹³ Response to the SEED opportunity was overwhelmingly positive. In almost all

¹²There was also a series of planned social activities that were implemented consistently across all training sites. These took place almost every evening and included debates, a cultural night (in which students representing different cultures rehearsed and performed dances), movie nights, a spelling bee, a lip-syncing competition (“miming”), stand-up comedy, quiz nights, and a social dance. In addition, sports activities were held each afternoon before dinner. Basic sports equipment (e.g., volleyballs, netballs, and soccer balls) was purchased for each school.

¹³The application form asked students to provide detailed contact information. It also included the question: ‘If

schools, the majority of the S6 class expressed interest in the program, resulting in 8,080 student applications. However, 313 students (3.9%) were dropped due to problems with their student IDs, 113 (1.3%) were excluded because they did not indicate their gender, and another 223 were dropped because they were already participating in another entrepreneurship training program. The remaining 7,431 served as the population universe for the study.

3.2 Student Assignment to Treatment Arms and Training Sites

Power calculations indicated that 1,200 students were needed in each arm (hard skills treatment, soft skills treatment, and control group), or 30 students in each of the 80 classes. Taking into account estimates of attrition rates from similar programs and the long period of time between recruitment and program implementation, the evaluation team over-enrolled each treatment arm by one third, accepting approximately 1,600 students in each arm, or 40 students per class. The control group remained at about 1,200 students. Therefore, we randomly sampled 4,402 students from the 7,431 eligible applicant pool to participate in the study, randomly assigning approximately 1,600 to each treatment group (SEED hard: 1,613, SEED soft: 1,591) and 1,198 to the control group. Students were randomly assigned to one of the soft/hard skills sites within their region, stratified by feeder school and gender. At each site, approximately 160 students were also randomly assigned to one of four classes of 40 youth each.

To minimize travel time, recruitment schools were clustered into four geographic regions, with students participating in the study being sent to a randomly selected school in their region. Of the 200 schools visited during data collection and recruitment, 20 eventually served as training sites. The distribution of training sites was chosen based on the number of individuals in the sample surveyed in each region to achieve fairly even numbers across regions. Approximately 40% of the sample attended schools in the West, 40% in the East (including 20% in the Jinja area and 20% in the Mbale area), and 20% in the North. As a result, eight sites were located in the West, eight in the East, and four in the North for a total of 20 training sites.

3.3 Teacher Training and Assignment

Each school was staffed with three teachers: two regular curriculum instructors (hard or soft skills), who taught regular curricula, and one instructor who focused exclusively on teaching the business plan curriculum. Teachers were randomly assigned to one of the training sites and to a classroom stratified by language ability.

Potential instructors were first trained in general teaching methods. Instruction was held five mornings per week for four weeks.¹⁴ Recruits who met the training requirements were then ran-

you participated in the SEED training, what business would you start and how would you start and run it? This question was included to indicate to students that SEED would accept serious applicants who have considered starting their own businesses.

¹⁴Teacher-trainees paid a fee of \$134 to enroll in the teacher training (or \$180.78 in 2021 USD) and, upon completion, received a formal certificate, which is highly valued in Uganda as it is perceived as a strong signal of quality.

domly assigned to teaching one of three following: (1) SEED hard skills, (2) SEED soft skills, and (3) business plan. The second training phase, lasting three weeks, focused exclusively on the assigned topic (hard, soft, or business plan).

The training was designed to establish the “what, how, and why” of each lesson, including the rationale of the content, thus endowing teachers with deep understanding and a sense of ownership of the material. Teachers received hands-on practice with their assigned lessons through read-through assemblies, mock lessons, presentations, and role-play. After the specialized training, the curriculum development consultants provided an additional day of coaching to several teachers who were identified as relatively weak based on consensus among trainers. All teachers had to pass a knowledge test to participate in the study.

4 Data, Attrition, and Compliance

A *baseline survey* was administered to all study participants at the time of recruitment and prior to assignment to study arms. The survey was framed as purely research-oriented and had no bearing on the chances that a student would be accepted. The 45 minute survey collected rich baseline information: demographic and family background characteristics as well as participants’ education, proxies of ability and intelligence, job experience, personality traits, and soft skills. Table A.1 reports summary statistics for study participants, as well as the results of balance tests between intervention groups.

At baseline, youth were on average 20 years old, 34% female, with 73% attending a boarding school and 70% planning to attend university. Study participants became active in the labor market at an early age (14.5 years old, on average) and, by the time they reached their last year of secondary school, approximately 40% owned a small business. Most of the youth’s parents had not completed secondary education (60% of fathers and 73% of mothers) and tended to be employed primarily in low-skill manual jobs. As alluded to in the introduction, in low income countries, nearly half of the labor force runs an enterprise; consistent with this figure, 51% of households in our sample owned a business at baseline.

Randomization achieved good balance across groups, with p -values associated to joint tests of whether the 30 covariates predict treatment statuses relative to the control exceeding 0.16. We test for balance across 30 controls, such that some individual coefficients are expected to be significant at conventional levels by chance. Few systematic differences are observed (only 5 out of 90 comparisons) and are quantitatively small.

Skills knowledge assessments were performed at the beginning and at the end of the training. These included a wide array of concepts at the core of the two curricula.¹⁵ The skill assessment

¹⁵Topics covered by the *hard skills test* included general business knowledge (e.g., meaning of an enterprise, definition of legal ownership, challenges and advantages of self-employment); concepts related to industry sectors, market competition and its implications; best business practices surrounding sales, marketing, and employee management; elements of profit/loss statements, utility of record keeping, and classification of costs; financing strategies to support capital and business investments; elements of successful business plans; and strategies to identify and develop good business ideas. The *soft skills assessment* instead focused on qualities and traits of successful entrepreneurs; com-

was administered to establish whether the two treatment arms endowed youth with different sets of skills that reflected the intensity of the assigned treatment arm. As discussed later, both treatments improved knowledge of hard and soft skills, with each arm producing larger gains in its area of emphasis.

In the context of the *4-year follow-up*, we collected data on an extensive set of outcomes that can be organized into four groups: (1) SES and demographic outcomes (e.g., education, self-assessed present and future social and wealth standings, time use); (2) labor market indicators (e.g., labor force participation, entrepreneurial success, wage and self-employment earnings, business investment, access to lending); (3) business knowledge and business/management practices; (4) self-reported and task-based measures of soft skills (e.g., negotiation, persuasion, patience, self-efficacy, stress, grit, and Big Five). Details on outcome definitions and variable construction are presented in Appendix A.4.

Four years after the intervention, 88.4% of the original sample was successfully tracked. Attrition was slightly higher for the control group than for the two treatment groups. Recontact rates were 85.3%, 89.7% and 89.3% for the control, hard and soft skills groups, respectively (Table A.3, Column 1). Females and older youth tended to attrit at higher rates, while youth who planned to attend university attrit less.

To assess differential attrition, we retest the balance across our 30 baseline covariates for the estimation sample used in our 4-year follow-up analysis (Table A.4): only 8 out of 90 comparisons are significantly different from zero at the 10% level; the p -values for joint tests of whether the 30 covariates predict treatment statuses are greater than 0.46, consistent with the notion that the samples remain well-balanced on various youth characteristics four years post-intervention.

Tables A.5a and A.6 document imperfect compliance with assignment among the two treatment groups, but no contamination of the control group (no defiers). 68.5% of those assigned to treatment (SEED hard: 67.58%; SEED soft: 69.45%) participated in SEED. Conditional on taking up treatment, the majority (84.4%) attended 28 or more of the 30 sessions. These take-up rates are in line with those of other entrepreneurship training programs, such as Groh et al. (2015), de Mel et al. (2013), and Calderon et al. (2020), and far exceed the 21% take-up rate in Bandiera et al. (2020).

9-year follow-up. Between October 2021 and April 2022, nine years after implementation, we re-surveyed study participants. An additional 105 observations were collected in the summer and fall of 2023.¹⁶ Data collection was carried out by phone survey due to the health environment in Uganda related to Covid-19 at the time of the survey. As in the 4-year data collection, nine years after the intervention, we successfully tracked 3,686 (~84%) of the baseline sample of 4,402, and completed 3,396 surveys (77.1%). Attrition was slightly higher in the control group (72.6% survey

munication, the importance of listening, elements of successful public speaking; negotiation strategies and desirable outcomes; attributes of win-win judgment; personal power (self-mastery, competence, vision, confidence); decision making skills; and the importance of teams and social networking.

¹⁶The survey instrument is largely unchanged in 2023, but certain financial modules were simplified. In our analysis, we express all financial amounts in 2021 US dollars and include a dummy variable for the observations collected in 2023.

completion) compared to the treatment groups (80.3% and 77.3% survey completion for the hard and soft treatment groups, respectively). 34% of the surveyed sample are women.¹⁷

We recheck the balance across all 30 baseline covariates for the estimation sample used in the 9-year follow-up analysis (Table A.7, in Appendix A.1). Only seven of the 90 comparisons are significantly different from zero at the 10% level, with p -values for joint tests of whether the 30 covariates predict treatment assignment (control vs. SEED hard or control vs. SEED soft) greater than 0.56, such that the samples remain well-balanced along various characteristics nine years after intervention. Even when comparing SEED hard vs. SEED soft, we still fail to reject the null, with a p -value of 0.13.

5 Estimation

The identification of program impacts relies on random assignment of applicants to SEED curricula and control groups. For parsimony and for a cleaner interpretation of the results, we present intent-to-treat (ITT) estimates, which capture the impact of offering SEED training regardless of actual take-up.¹⁸

Our main estimating equation for the ITTs is given by

$$Y_i = g(T_i^j, X_i) + \varepsilon_i, \quad \text{where } j = \text{hard, soft} \quad (1)$$

where Y_i denotes outcome Y for youth i ; T_i^h and T_i^s correspond to hard skills and soft skills treatment indicators, respectively; X_i is a vector of baseline characteristics; and $g(\cdot)$ is an unknown function, which is a nuisance parameter. The model is estimated separately for each treatment arm. Therefore,

$$ITT_j = \beta_j = E[g(T^j = 1, X) - g(T^j = 0, X)], \quad \text{where } j = \text{hard, soft} \quad (2)$$

We report here *Double/Debiased Machine Learning (DML)* estimates (Chernozhukov et al., 2018), which rely on Neyman-orthogonal scores and yield valid estimation and inference for parameters of interest in the presence of a high-dimensional and potentially nonlinear nuisance parameter.¹⁹ DML ITTs and standard errors are estimated using an interactive model in which each treatment dummy is not additively separable.²⁰

¹⁷Overall, our effective response rate is relatively high and compares favorably to many other long-term studies reviewed by Bouguen et al. (2019). The recontact and completion rates in this study are remarkably higher than in other phone surveys. During approximately the same period, IPA’s average response rate for phone surveys was 56% based on an existing sample of 41 studies covering 20 countries—see IPA report. Our low attrition rate is especially significant considering that it relates to a long-term follow-up.

¹⁸Local Average Treatment Effect (LATE) estimates of the effect of treatment on the treated using initial random assignment as an instrument would be proportional to ITT estimates under a monotonicity assumption (no defiers).

¹⁹The main results and overall conclusions are preserved when omitting baseline controls, X_i ; DML improves precision.

²⁰DML estimates rely on K -fold cross-fitting (in our case $K = 5$) to minimize overfitting. In finite samples, the dependence of the estimator on the particular split creates an additional source of variation. Following Chernozhukov

Recent work has drawn attention to the pitfalls of transformed regressions with a mass at zero and has highlighted the sensitivity of estimated treatment effects to the outcome’s unit of measure and to its transformation (e.g., $\log(Y + 1)$ or $\text{arcsinh}(Y)$; see Mullahy and Norton (2024); Chen and Roth (2024); Aihounton and Henningsen (2021).²¹ In our analyses, financial outcomes (e.g., earnings, revenues, and capital) are measured in levels and winsorized at the 97th percentile. As a robustness check, we also estimate Poisson models with double selection (Lasso), as in Belloni et al. (2016), which require the weakly positive outcomes delivered by the 97th percentile winsorization. Results are robust and very similar across specifications.

To address concerns of over-rejection of the null hypothesis due to multiple inference, in line with other recent work,²² we aggregate families of outcomes into a single dimension or index following Anderson (2008)’s approach, whereby each index is constructed as a weighted mean of the standardized components. Furthermore, Viviano, Wuthrich, and Niehaus (2025) recently provided an economic foundation for multiple hypothesis testing practices and showed that the economically optimal index aligns with the classical statistical reasoning of Anderson (2008) when the outcomes capture or are proxies of related concepts.

6 Results

This section organizes the results into categories related to their temporal distance from the training. We first discuss the effects of the program on knowledge of hard and soft skills immediately after training and four years after the intervention. The 4-year data collection included task-based measures for persuasion and negotiation, as well as self-reported measures of personality traits and soft skills. It is important to note that skills such as negotiation and persuasion were explicitly taught in the context of the soft SEED curriculum, but not in the hard SEED. Personality traits (e.g., Big Five, Stress, Self-Efficacy, etc.) are thought to be important to entrepreneurial success and could have been influenced by the program either directly (during lessons covering topics such as self-management, personal power, goal setting) or indirectly. The impacts of the program on business creation and performance in the medium and long runs are discussed next. We conclude by

et al. (2018), to incorporate a measure of this additional source of variation in the estimates and their standard errors, the estimation step is repeated $S = 100$ times. Sample medians of the estimates and median standard errors obtained across the S replications/splits are reported. We use random forests as the base learners in the DML estimation. Ensemble learners aggregate predictions from multiple algorithms (base learners) to improve out-of-sample predictive performance, which could further reduce estimation error in the nuisance parameter and increase the precision of the treatment effects. When re-estimating effects on business and total earnings using ensemble learners, treatment effect estimates remain qualitatively unchanged.

²¹Chen and Roth (2024) derive formal results showing that scale dependence is a necessary feature of any identified treatment effect on outcomes with a mass at zero (revenues, earnings, capital, etc.). The authors show that when the treatment has an effect on the extensive margin –as in our study– estimates using the $\log(Y + 1)$ or $\text{arcsinh}(Y)$ transformations cannot be interpreted as percentage effects since they depend on the outcome’s unit and treatment effects are arbitrarily sensitive to scaling. Chen and Roth (2024) provide an intuition for their results: the arbitrary unit dependence arises because an individual-level percentage effect is not well-defined for individuals whose outcomes change from zero to a nonzero amount when receiving treatment, and the units of the outcome implicitly determine how much weight the treatment effect for a log-like transformation places on the extensive margin.

²²See for instance Corno, Ferrara, and Burns (2022); Allcott, Braghieri, Eichmeyer, and Gentzkow (2020); Giacobino, Huillery, Michel, and Sage (2024).

reviewing whether and to what extent SEED altered educational investments and/or was rewarded in the labor market.

In our main tables, we report one-sided p -values for primary business outcomes (e.g., business ownership, revenue, earnings, and adoption of business practices) and skills upgrading relative to the control group, where the theory of change for training unambiguously predicts an improvement. Indeed, SEED was designed to increase entrepreneurial skills and business performance; a negative treatment effect on these outcomes would be substantively equivalent to a null effect (i.e., the training failed to improve outcomes). Two-sided p -values are reported for outcomes for which the theory of change does not deliver a clear prediction; i.e., for outcomes that could act either as complements or substitutes for self-employment (i.e., education and wage work), as well as for comparisons between curricula, peer effects, and causal mediation. The main conclusions of the paper are preserved if two-sided p -values are adopted uniformly. However, a loss of statistical significance would be observed for the impact of business earnings for the individual treatment arms; the business earnings impacts would remain significant when pooling across them.²³

6.1 Knowledge Assessments Post-Treatment

Students who attended SEED were administered a hard and soft skills knowledge test at the beginning and at the end of the mini-MBA. The pre- and post-training knowledge assessments were identical except that the order of questions differs between the two tests. Aggregate test scores were calculated as standardized weighted averages, following [Anderson \(2008\)](#).²⁴

After three weeks of training, both curricula were associated with significant improvements in test scores for hard and soft skills relative to pre-program levels, as illustrated in [Figure 2](#), which presents distributions of hard and soft skills knowledge test scores before and after training across treatment arms. The two curricula also led to a significant differential accrual in hard and soft skills knowledge compared to pretraining ([Table 2](#)). Focusing on *hard skills knowledge*, youth recorded large gains of 0.76 sd and 0.36 sd in the SEED hard and soft skills training arms, respectively. Equivalently, the hard skills knowledge gap grew by 0.4 sd favoring the hard SEED group relative to the soft SEED. The estimated learning gap remains largely unchanged when controlling for pre-SEED test performance and additional controls. In terms of *soft skills knowledge*, the post-training soft skills test scores for both treatment groups improved significantly: soft skills test scores increased by 0.74 sd and 0.46 sd for those in the soft skills and hard skills groups, respectively, implying a 0.28 sd score difference between treatment groups, consistent with the skills intensity of the assigned curricula.

²³Loss of significance would also impact the single-arm estimates for knowledge about the effects of competition for SEED hard and cost categorization for SEED soft, for the number of active businesses at the 9-year follow-up, as well as for business management practices (9-year) component for SEED soft, none of which are explicitly discussed in the paper. For all negotiation outcomes, the p -values are two-sided.

²⁴Test scores for each assessment are standardized with respect to the mean and standard deviation of pre-treatment test performances.

6.2 Hard and Soft Skills: 4-years Post Intervention

Four years after the intervention, meaningful differences in hard skills knowledge, soft skills, and personality traits persisted in both treatment groups relative to the control group. In particular, both treatment groups scored higher on the hard skills knowledge assessments compared to the control group (Table 3): SEED graduates scored better (approximately 0.10 sd), with no significant differences between hard and soft curricula. The soft SEED group displayed better mastery of persuasion and negotiation skills, which were explicitly taught in the soft curriculum.²⁵

6.2.1 Negotiation and Persuasion

When establishing and growing a business venture, entrepreneurs constantly engage in negotiation to reach agreements with stakeholders, broker favorable prices, persuade and convincingly present their business plans and points of view, which makes negotiation skills essential for entrepreneurial success (Artinger et al., 2015). We rely on task-based measures to quantify participants’ ability to successfully leverage *negotiation* and *persuasion* skills and strategies in a simulated professional situation. Negotiation and persuasion were taught only in the SEED soft curriculum (e.g., negotiation, persuasion, communication, public speaking, etc.).

The defining characteristic of *negotiation* is the existence of two parties who share a goal, but have conflicting interests (Bazerman and Neale, 1994). Negotiation is the process of interpersonal communication by which interested parties resolve disputes, agree upon courses of action, bargain for individual or collective advantage, and/or attempt to craft outcomes that serve their mutual interests. Effective negotiation involves skills such as communication, persuasion, planning, strategic thinking, and cooperation (Thompson, 1990; Bazerman et al., 2000). To evaluate the negotiation abilities of the study participants, we conducted a lab field experiment with real rewards for both players.²⁶

The *Buyer* plays the role of the Commissioner of the Ministry of Lands, who is tasked with purchasing Butagira Farms to construct a rail line. The *Seller* plays the role of the owner of Butagira Farms. The Buyer (the enumerator) and the Seller (the respondent) have already agreed that the land is worth UGX 600 million (approximately \$573,295.75, PPP adjusted), but the two will need to agree (i) on financing terms, that is, how much is paid upfront, with the remainder being paid in equal installments over a 12-month period (Table 5, Column 2); and (ii) on the project start date, between two and 12 months (Table 5, Column 3).

Both Buyer and Seller were informed that they will be entered into a lottery carrying a \$400

²⁵Recent contributions have highlighted the role of negotiation and persuasion skills – at the center of the soft SEED intervention – in shaping education outcomes (Ashraf et al., 2020, 2025, in Zambia), adolescent girls’ gender attitudes (Dhar et al., 2022, in India), and women’s labor market participation, one of the most common topics of intra-household disagreement (Namrata and McKelway, 2025, in India). Overall, youth in the treatment groups preserved their advantages in terms of soft skills and personality traits relative to the control group.

²⁶The negotiation task was based on Bontempo and Iyengar (2008) and fully adapted to the Ugandan context. It featured an integrative structure in which the negotiating parties have asymmetric preferences over two dimensions, allowing for mutually beneficial – Pareto-improving – tradeoffs across dimensions (Fisher et al., 1991; Walton and McKersie, 1965).

prize, with the probability of winning being a function of the number of points obtained in the final deal based on the payoffs in Table 4.²⁷ The Seller and Buyer have five minutes to reach an agreement. If they reach an agreement, both parties are eligible for the lottery. Conversely, failure to agree results in their ineligibility for the lottery.

Participants in the soft skills-focused SEED negotiated better outcomes not only compared to the control group but also relative to those in the hard skills-focused SEED (Table 5). The Seller’s (respondent) best outcome corresponds to the full upfront payment (down payment equal to UGX 600 million) and a project start date in 12 months.²⁸ A high percentage (81.3%) of study participants in the control groups achieve agreement. Negotiation strategies employed by those in the soft SEED group did not appear to influence the likelihood of agreement; however, the strategies adopted by the hard SEED treatment group led to slightly fewer agreements (SEED hard: 2.8 percentage points (pp) or 3.3%).

Only youth in the soft skill SEED struck better/more advantageous deals for themselves, with later starting dates (8.1%, approximately 11 days) and higher down payments (4.4%, or UGX16.5 million/\$15,760, which is roughly 2.6% of the value of the land), relative to the control group. There are no statistically significant impacts for those who attended the hard skills treatment.

At the core of negotiation skills is *persuasion*; that is, the process of changing (without duress) a person’s opinion, feelings, behaviors, or general evaluations (attitudes) toward an object, issue, or person (Cialdini, 2001). Communication, emotional intelligence, active listening, logic, and reasoning are some of the key skills for persuasion (Cialdini, 2018).²⁹

During the persuasion task, the participant was asked to convince a group of hypothetical government officials who intended to distribute more land to farmers that they (i.e., the participant) should be granted more land, which, in turn, will make their business more profitable. Youth in the study were given one minute to make a persuasive pitch, with their conversations being audio recorded. To assess the quality of the case they made, MBA students and business professionals recruited in Uganda were asked to score youth’s performance during the *persuasion task*.

Youth in the soft skills treatment were more persuasive than those in the control group (Table 5). In particular, they were more likely to be identified as convincing (1.5 pp or equivalent to 68% more convincing) and more likely to be someone whom the evaluators would hire (1.6 pp, or 61%,

²⁷Table 4 also summarizes the Buyer’s and Seller’s ideal outcomes and strategies. The Buyer prefers as small a down payment as possible and for the project to start in two months. The Buyer assigns relatively higher weight to the starting date (more points) than to the financing arrangement (fewer points). The Seller prefers a full payment of UGX 600 million up front, and a project start date in 12 months. The Seller places more weight (more points) on the financing arrangement than on the starting date (fewer points).

²⁸In a separate paper, we study the negotiation strategies in detail: youth in the soft treatment arm engage in lengthier conversations and provide longer arguments (as proxied by the number of words used by both Sellers and Buyers), and engage in more rounds of offers and counter-offers.

²⁹Cialdini (2018) describes six principles related to persuasion: (1) Liking – people like those who like them (uncover real similarities and offer genuine praise); (2) Reciprocity – people repay in kind (give what you want to receive); (3) Social proof – people follow the lead similar to that of others (use peer power whenever it is available); (4) Consistency – people align with their clear commitments (make their commitments active, public, and voluntary); (5) Authority – people defer to experts (expose your expertise; don’t assume it is self-evident); and (6) Scarcity – people want more of what they can have less of (highlight unique benefits and exclusive information).

more likely to be hired). Consistent with the results of the negotiation task, there are no significant impacts for the hard skill treatment group compared to the control group. However, we cannot reject the null of equal impacts for the two treatment groups.

6.2.2 Personality Traits and Skills: 4-year Follow-up

SEED graduates exhibited a greater ability to maintain stability and avoid disruption in the emotional and social domains (*Stability*: 0.142 sd for SEED hard; 0.095 sd for SEED soft, both significant at conventional levels (Table 6, Column 2) and to engage flexibly with novelty, in both behavior and cognition (*Plasticity*: SEED hard: 0.114 sd; SEED soft: 0.138 sd; Column 1).³⁰ For both traits, the effects for the hard and soft curricula are not statistically distinguishable from each other. The gains in psycho-social skills extended to their ability to better handle stress (Table 6, Column 4), with estimated effects of 0.23 sd and 0.19 sd for hard and soft curricula, respectively.

Although the gaps in *intrapersonal skills* (as proxied by Plasticity, Stability, and Stress management skills) between the two treatments closed four years post intervention, some important differences remained. These favored the soft skills treatment group in terms of Self-efficacy (i.e., the belief in one’s ability to perform tasks effectively, including interpersonal tasks, needed to achieve a valued goal) and other interpersonal skills, as captured by task-based measures of negotiation and persuasion skills.³¹

6.3 Entrepreneurship: Medium and Long Term Impacts

This study offers rare insight into both the longitudinal impacts of entrepreneurship training and the entrepreneurial trajectories over a decade-long horizon. At the time of the 4-year follow-up, our sample was in their mid-20s and almost half (47% of the control group) had started a business at some point. The majority (64% of the control group) was currently economically active, with 28% owning at least one active business (Table 9a) and 43% working for someone else.³² Furthermore, 52% were also still enrolled in post secondary education (Table 8), with nearly 21% juggling education and economic activities.

Against this backdrop, we first focus on business creation and performance to understand whether SEED-acquired skills and business knowledge shaped entrepreneurship and business success.³³ Below, we begin by reviewing medium run impacts, followed by those after nine years,

³⁰The Big Five taxonomy of personality traits (Goldberg, 1993; John et al., 1991) was initially conceptualized as containing orthogonal dimensions. Recent work has revealed the presence of two higher-order personality traits: (1) *Stability, Self-Control, or Alpha* is composed of the shared variance of Emotional Stability (Neuroticism reversed), Conscientiousness, and Agreeableness; (2) *Plasticity, Engagement, or Beta* is composed of the shared variance of Extroversion and Openness/Intellect. For a review of these constructs, see De Young (2006), Hirsh et al. (2009) and the citations therein. In Appendix Table A.9, we report results for the individual dimensions of the Big Five.

³¹Self-efficacy beliefs determine how people feel, think, motivate themselves and behave (Bandura, 2010). Self-efficacy does not refer to one’s abilities, but to how strongly one believes that one can use one’s own abilities to work toward goals (Latham and Locke, 2007; Bandura, 2010).

³²Economic activity and labor market participation are discussed in Section 6.5 and can be found in Table 12a.

³³As a reminder, business and labor market outcomes are defined as the joint outcome of owning a business/working for someone else and the outcome under consideration. Estimates for outcomes that are conditional on employment

highlighting the temporal evolution of the effects.

6.3.1 Entrepreneurial History, Experience, and Performance at 4-year Follow-up

Since the end of the training, SEED graduates engaged in entrepreneurship at higher rates and accrued more business experience than the control group, whether proxied by the number of business starts or the time they spent in entrepreneurial endeavors.³⁴ They were not only more likely to ever start a business (10.2 and 10.8 pp for hard and soft treatments, respectively) relative to youth in the control group, 47.4% of whom ever started a business, but also started more businesses (SEED hard: 0.109 or 25.1%; SEED soft: 0.136 or 31.3%) and, were more successful in ensuring their survival (Table 7, Columns 1 and 2, and Table 9a, Column 1). Another dimension of business experience is the length of time during which youth engaged in active enterprises: those in the treatment groups spent 25% more time (approximately 2.5 months) managing a business venture (Table 7, Column 3).³⁵

Within the control group, 27.6% owned one or more businesses that were active at the time of the 4-year follow-up. Youth in both treatment groups were more likely to own active enterprises (SEED hard: 4.1 pp or 15%; SEED soft: 6 pp or 22%), with no statistically significant differences between them (Table 9a).

Business Quality, 4-year. The nature and profiles of the firms owned by the treatment groups indicate that the intervention contributed to the formation of higher-quality entrepreneurial endeavors. Active businesses owned by youth enrolled in SEED were more likely to have employees (SEED hard: 4.2 pp or 15.3%; SEED soft: 6 pp or 21.9%) and to be ventures with partners (SEED hard: 1.9 pp or 28.4%; SEED soft: 3.2 pp or 47.8%) relative to the control group. Most businesses at the 4-year mark tended to be informal (neither registered nor paying taxes): only 12.2% of the control group met at least one of the formality criteria, yet the program was successful in increasing formality, especially for those enrolled in the SEED soft curriculum (SEED soft: 2.3 pp or 18.8%, significant at the 5% level).

Management Practices, 4-year. Further evidence on the promise of this intervention emerges when studying managerial practices (Table 10a). SEED graduates not only created higher quality businesses, but also adopted better practices regarding competition (negotiating prices, visiting their competitors, or promoting their business) and business management (e.g., maintained business records, took financial and hiring/firing decisions). Overall, the program led to more frequent adoption of best practices (effect size around 0.175 sd), with similar effects when focusing on sub-indices for competition (SEED hard: 0.175 sd; SEED soft: 0.126 sd) and for management practices (SEED hard: 0.13 sd; SEED soft: 0.181 sd).

Performance, 4-year. We find some evidence that ventures started by the treatment groups

status (e.g., defined only for entrepreneurs and/or wage workers) would be biased and inconsistent, since they would result from conditioning on an outcome that is endogenous to treatment.

³⁴See Table A.10 in the Appendix for summary statistics on business sectors.

³⁵In the 9-year follow-up, we did not ask about retrospective business starts; the decision was chiefly driven by the need for parsimony since the data collection was implemented as a phone survey in response to the Covid pandemic.

performed better than those of the control group along several dimensions: revenues (SEED hard: \$20.7 or 7%; SEED soft: \$16.4 or 5.5%), profit margins, measured by business earnings over revenues (SEED hard: 2.0 pp or 14%; SEED soft: 3.6 pp or 25.2%), and profits (SEED hard: \$7.9 or 5.4%; SEED soft: \$13.8 or 9.5%), although the point estimates for profits and revenues are not statistically significant at conventional levels (Table 11a).

It is worth noting that these estimates are a combination of effects along the intensive and extensive margins (only a third of study participants are involved in active businesses) and may thus be pulled towards zero. Furthermore, as in Duflo et al. (2021), earnings data are noisy and likely censored: 52% of youth were still enrolled in post-secondary and 21% of the 4-year active businesses were run concurrently with other endeavors (i.e., school, wage work). It is also well known that profits and sales are measured with substantial noise in small firms (de Mel et al., 2009; Anderson et al., 2021), such that precision may not be achieved even in large samples such as ours (a point discussed in detail in McKenzie, 2021; McKenzie and Woodruff, 2014). McKenzie (2021)’s meta-analysis concluded that optimistic impacts of training programs on profits and revenues would range between 5 and 10% increases, a magnitude that is in line with our point estimates at the 4-year data collection. Encouragingly, we fail to reject the null that the 4-year effect sizes are statistically different from 10%.

6.3.2 Business Characteristics and Performance, 9-year Follow-up

Shifting focus to the long run, we first draw attention to some features of economic engagement among the more mature Ugandan sample, in their late twenties / early thirties. At the time of the long term follow-up, nearly 80.5% of the study sample had completed post-secondary education, either university or professional certificates. Ninety percent of the control group reported participating in economic activities (against the 63.9% five years earlier, see Column 1 in Table 12), either as business owners (58.3%, nearly double the 4-year rate, Table 9) or as wage workers (55.6%, 12.4 pp higher than at the 4-year mark, Table 12). According to the 2019/2020 Uganda Household Survey,³⁶ the employment rates (across all age groups) in the Ugandan population were 72.3% and 54.9% for males and females, respectively. Therefore, it is not surprising that a relatively younger and higher education segment of the population would actively participate in the economy at higher rates.

The participation rates in self-employment for the treatment and control groups were very similar, around 58.3% (Table 9b, Column 1), with no significant differences between experimental groups. Comparing these results with those of the 4-year follow-up, treatment and control groups all increased their entrepreneurship efforts, with the control group doubling its likelihood of owning at least one active business (4-year: 27.6%, 9-year: 58.3%). The expansion in self-employment is in line with the sector’s prominence in Africa, including Uganda.³⁷

³⁶<https://www.ubos.org/uganda-national-household-survey/>

³⁷In the 9-year survey, we did not ask about retrospective business starts; the decision was largely driven by the need for parsimony since the 9-year survey was implemented as a phone survey in response to the Covid pandemic.

Business Quality, 9-year. Although the ownership gap in active businesses between treatment arms disappeared nine years after the intervention, there were still important differences in business quality, size, and performance. SEED participants still owned higher quality enterprises: they were more likely to be in partnership with other entrepreneurs (SEED pooled: 2.1 pp or 20.8%) and also appeared to be more formal, though these estimates are noisier, with a p -value of 0.143 (SEED pooled: 2 pp or 5.9%). While SEED participants were not more likely to have employees (paid or unpaid; Table 9b), they more often had paid employees (SEED pooled: 3.1 pp, or 9.3%; Table A.11), consistent with a shift in the composition of labor toward more formal employment relationships.³⁸ Taken together, when aggregating these dimensions into a single quality index, SEED is associated with higher quality business endeavors in the long run (~ 0.074 sd; Table 9b Column 7).

The magnitudes of these 9-year effects are quite similar to those of the 4-year follow-up, despite the improvements in the control group between surveys. Over time, the control group was not only more likely to manage active businesses relative to the 4-year measurement (4-year: 27.6%; 9-year: 58.3%), but was also more likely to start formal businesses (4-year: 12.2%; 9-year: 33.8%), marginally more likely to have partners (4-year: 6.7%; 9-year: 10.1%), and to have employees (4-year: 27.4%; 9-year: 40.6%). In summary, the quality of the enterprises established by the control group increased over time, yet both treatment groups preserved their quality advantage (4-year: 0.084 sd; 9-year: 0.074 sd).

Management Practices, 9-year. The firms in the treatment groups adopted better management practices in the long term compared to the control group in all dimensions considered: competition and business management (Table 10b). In addition, they were more open to innovation and relied on more modern technologies, as proxied by fintech adoption (i.e., use of mobile money as a form of payment or to pay employees) and use of other technology (i.e., digital records and reliance on IT solutions to run their businesses). The pooled effect sizes are around 0.09 sd for all management practices and are statistically indistinguishable between the treatment groups.

Performance, 9-year. Nine years post intervention, given that the treatment and control groups converged along the extensive margin of self-employment, an even more pressing question relates to the performance, size, and profitability of SEED enterprises relative to those of the control group (intensive margin). Table 11b presents the results for business performance, as proxied by monthly revenues, profits, capital, profit margin, and return to capital.³⁹

The business ventures of the *control group* grew significantly relative to the 4-year measurement: business revenues (4-year: \$295.78; 9-year: \$1,044.57) and profits (4-year: \$145.96; 9-year: \$472.00) nearly tripled. Yet ventures in the two treatment groups outpaced this growth, expanding their edge in terms of performance. First, SEED graduates reported significantly higher monthly sales volumes (SEED hard: \$216.45 or 20.7%; SEED soft: \$195.16 or 18.7%; Pooled \$205.26 or 19.7%) and higher monthly profits (SEED hard: 15.8%; SEED soft: 16.6%; Pooled: 16.0%). The program

³⁸The 4-year survey did not distinguish between paid and unpaid employees, whereas the 9-year survey explicitly asked about both, allowing for greater granularity.

³⁹All financial and monetary amounts are expressed in 2021 PPP adjusted US dollars to ensure comparability across surveys.

translated into \$74.46 and \$78.40 in additional business earnings per month for the hard and soft skills treatment groups, respectively. We still fail to reject the null that the two curricula delivered identical treatment effects. Compared to the medium run (four years), pooling across SEED hard and SEED soft arms, the program impacts on business profits increased more than sevenfold: \$10.08 at the 4-year mark vs. \$75.40 five years later.

Productivity, 9-year. Overall, in the long run, SEED participants operated firms at higher output levels (Table 11b), reporting larger revenues and profits without acquiring more capital (Column 5) or employing more labor (proxied by paid and unpaid employees, Column 4). Further, these higher output levels occurred in the absence of impacts on profit margins, suggesting similar price–cost markups and overall cost structures relative to the control group. The larger scale operations were accompanied by higher returns to capital, defined as business profits divided by capital (SEED Hard: 13.8 pp, SEED Soft: 13.8 pp; SEED Pooled: 13.5 pp). These findings are consistent with an upward shift of the production function – i.e., an increase in total factor productivity (TFP) – although, some of the TFP gain may partially reflect a shift in the composition of labor (paid versus unpaid employees).⁴⁰ The observed rise in TFP with concomitant adoption of better business practices in the medium and long runs echoes the findings of Bloom et al. (2013, 2020); Iacovone et al. (2022); McKenzie and Woodruff (2014), who found that management training in large firms led to increases in efficiency and productivity. Bloom et al. (2017) and Bloom and Van Reenen (2007) first advanced the idea that management practices might be akin to “technology” and raise TFP. In the next section (Section 6.4), we formally assess the extent to which improved business practices—and other candidate channels—account for these long term effects.

Age of business. SEED treatment effects are not explained by differential maturity/age of the businesses owned by the treatment group. Although those in the treatment group started more businesses and owned more active businesses at the 4-year mark, their active businesses after nine years were relatively new enterprises, with a median (unconditional) age across firms owned by the same individual of 21 months for all assignment groups (Table 9b).⁴¹ The lack of difference in business age makes the comparison in performance and quality even more meaningful. It also corroborates the theory that entrepreneurship is a process of trial and error / learning-by-doing, which imparts skills and learning that are valuable in subsequent endeavors (Manso, 2016; Thompson, 2010).

Covid. Finally, combining results on business performance and on age of business endeavors (where the median age is 35 months) with the timing of our data collection (2021 - during the Covid pandemic), our findings suggest that SEED acted as a protective factor that mitigated the impacts of Covid: youth in the treatment groups operated more resilient ventures during the post-Covid

⁴⁰In the 9-year survey, study participants were more likely to report having paid employees, but without statistically significant differences in total employment across both paid and unpaid workers (see Tables 11b and A.11 in Appendix A).

⁴¹We fail to detect any differences across experimental groups in the minimum/youngest (18.6 months) and maximum/oldest (23.2 months) ages of active businesses owned by a given individual. Even when focusing on age of existing businesses, conditional on being self-employed, the median age was 35 months, with the maximum age (oldest) being around 39 months at the time of the survey.

recovery compared to those in the control group. Our results are in line with those of [Alfonsi et al. \(2024\)](#), whose RCT studied the impact of vocational training and firm-sponsored training. They also found that skills acquired through vocational training survive the pandemic.⁴²

In summary, SEED training was successful in expanding youth’s human capital (soft and hard skills) to set them on higher earnings trajectories and expand income opportunities. Moreover, the program contributed to the creation of larger and more vibrant ventures, employing better practices and adopting technology solutions at higher rates, with SEED graduates behaving like *transformational/opportunity entrepreneurs* (as in [Schoar, 2010](#); [Ardagna and Lusardi, 2010](#)). That is, they were more successful in creating dynamic firms that extended beyond the scope of an individual’s subsistence needs.

6.4 Mechanisms

In this section, we study some of the potential mechanisms underlying SEED’s long term impacts. We first leverage mediation analysis to evaluate the importance of intermediate outcomes (i.e., experience, management practices, personality traits, and soft skills) in mediating SEED’s long run impacts. We close the section by examining the role of peer effects. In particular, we test the extent to which the quality, experience, and digital and geographic proximity of peers during the SEED training shaped participants’ self-employment and business earnings nine years after the intervention.

6.4.1 Mediation

The previous sections point to at least four distinct intermediate outcomes and mechanisms that could explain the long-term success of businesses led by SEED graduates: (i) business experience and experimentation (Table 7); (ii) hard skills knowledge (Table 3); (iii) soft skills (Table 6); and (iv) business practices (Table 10a). To quantify *descriptively* the relative importance of these channels, we turn to the literature on mediation analysis (see, for instance, [Huber, 2023, 2021](#)). The goal is to decompose the impacts of the program (T , SEED training) for selected 9-year outcomes (Y , business earnings or managerial practices) into the program’s (average) *direct effects* on Y keeping the potential mediators fixed:

$$\theta_{DE}(T) = \mathbb{E}[Y(1, M(T)) - Y(0, M(T))], \quad T \in \{0, 1\}$$

and its (average) *indirect effects* through a set of potential mediators measured at the 4-year follow-up $M(T)$ (i.e., experience, managerial practices, hard and soft skills) while holding constant treatment status to block the program’s direct effect:

$$\delta_{IE}(T) = \mathbb{E}[Y(T, M(1)) - Y(T, M(0))], \quad T \in \{0, 1\}.$$

⁴²In contrast, [Barrera-Orsorio et al. \(2022\)](#) consider the return to skills of applicants randomly assigned to *service sector-specific* training programs in Colombia. The training’s pre-Covid positive impacts vanished during the pandemic and did not re-appear 1.5 years post pandemic.

The (average) total effect is then the sum of the direct effect (net of a mediating variable of interest) and the indirect effect of *opposite treatment statuses* (Pearl, 2001; Imai et al., 2010; Imai and Tingley, 2011):

$$\Delta_{TE} = \mathbb{E}[Y(1, M(1)) - Y(0, M(0))] = \theta(1) + \delta(0) = \theta(0) + \delta(1).$$

Even when treatment is randomly assigned, additional assumptions are needed to give the mediation effect a causal interpretation. A very popular approach relies on *selection-on-observables*-type assumptions (e.g., Heckman et al., 2013; Huber et al., 2018; Flores and Flores-Lagunes, 2009) so that the treatment and mediator are conditionally exogenous when controlling for observed covariates. Conditional independence of treatment in RCTs is achieved mechanically. However, conditional independence of the mediator (or *sequential ignorability*) requires that the mediator behave “*as if*” at random, conditional on treatment and pretreatment controls. As a result, this assumption may not hold even in randomized experiments (Imai et al., 2010) – especially when, as in our case, the time-span between treatment and measurement of the mediators is significant. We recognize this limitation and do not interpret our mediation results as causal, but rather as suggestive of the underlying mechanisms and descriptive of their relative importance.

We implement Farbmacher et al. (2022)’s approach, who combine causal mediation analysis with double machine learning. As the authors emphasize, the selection of confounders, X , and their functional form are key to ensuring that the selection-on-observables assumption holds approximately. The data-driven approach removes researchers’ arbitrary decisions in model selection and is well-suited to settings with high-dimensional data with many potential controls such as ours.

Figure 3 presents the total, direct, and indirect effects on business earnings and managerial practices, measured at the 9-year survey, for the pooled treatment group. In addition to indirect and direct effects for individual mechanisms, the “*All Mediators*” label captures the direct and indirect effects when all mediators in the figure are jointly considered.⁴³

A meaningful portion of SEED’s impacts on *business earnings* appears to be explained by mediators. In single-mediator models, the mediated effects associated with early business experience and business practices measured at the 4-year follow-up are large and capture 68.8% and 43.6% of the total (DML) effect, respectively (Subfigure 3a). The contribution of all soft skills (proxied by an Anderson-style index whose components are plasticity, stability, self-efficacy, stress) is insignificant and smaller in magnitude (~17.3%). Unpacking the soft skills index, we note that Plasticity is the only soft skill with a statistically significant indirect effect, explaining 16.2% of the total effect. Panel (3b) focuses on the role of the Big Five’s individual components alongside stress management and self-efficacy as potential mediators for business earnings.⁴⁴ Extroversion and openness (the two

⁴³As noted earlier, while the sum of the direct and indirect effects for opposite treatment statuses corresponds to the total effect, the sum of the direct and indirect effects for a given treatment status is not bounded by the total effect. In addition, the “All Mediators” direct/indirect effect is not additive in those of individual mediators.

⁴⁴We do not include negotiation and persuasion in these graphs to preserve the same sample sizes across the four panels. When included, the indirect effects for the persuasion and negotiation index are insignificant and account for 1% and 0.6% of profits and business practices’ total effects, respectively.

Big Five dimensions underpinning plasticity) are the only mediators with statistically significant indirect effects. The aggregate indirect effect of all these soft skills mechanisms explains ~24.4% of the total DML effect.

Business practices can be thought of as a reduced form of hard and soft skills as well as personality traits. Business owners need to know what to do, but also need to possess the skills and mindset to execute them. Subfigures (3c) and (3d) examine the extent to which 4-year mediating variables explain the adoption of business practices at 9-year follow-up. First, in stark contrast to business earnings, the four types of mechanisms considered do not appear to explain a significant portion of managerial practices at the 9-year follow-up. Most of the indirect effects are small in magnitude, with SEED’s direct effects playing a more prominent role. Once again, adoption of good management practices at the 4-year mark, experience, and plasticity are statistically significant indirect effects. They respectively capture 21.1%, 9.6%, and 11.7% of the total effect—the grouped indirect effect captures roughly 30% of the DML point estimate.⁴⁵ That is, mediators played a secondary role in the production function of managerial practices compared to their roles for business earnings. In particular, business experience alone does not appear to be an important channel through which good practices were developed in the treatment group and is not a substitute for program’s direct effects. Subfigure (3d) considers individual soft skills and Big Five traits. Openness and Extroversion are the only statistically significant mediators and explain 11.7% and 8% of the total effect, respectively.

Plasticity governs behavioral and cognitive exploration, and novel information processing (Hirsh et al., 2009; Mann et al., 2021). In particular, *Openness* is associated with exploratory mindset and creativity (Puente-Díaz et al., 2022; Kaufman et al., 2015); opportunity recognition (Hagenauer and Zipko, 2024); cognitive flexibility for creative problem solving (Abu Raya et al., 2023); and learning orientation through deeper or elaborative learning styles. These traits align with popular descriptions of the *entrepreneurial mindset*, which can be traced to (Schumpeter, 1965, p.55), who characterized entrepreneurs as creative disruptors and innovators. Indeed, a substantial body of research across the psychology and management disciplines has examined the fundamental traits that underlie entrepreneurial behavior. This literature has documented systematic relationships between openness and plasticity and entrepreneurial activity, risk-taking, leadership, and innovation.⁴⁶

In Appendix A.2, Table A.12, we implement Imai et al. (2010)’s sensitivity analysis to evaluate the robustness of statistically significant indirect effects to potential violations of the sequential ignorability assumption to unmeasured pre-treatment confounding.⁴⁷ When considering business

⁴⁵The sum of indirect effects of individual mediators is larger than the grouped mediator because of shared variance among correlated mediators.

⁴⁶For instance, Marcati et al. (2008) find that the ability of SME entrepreneurs to innovate is closely associated with openness to experience and extroversion (i.e., plasticity). In their review, Kritikos (2022) highlighted how openness to experience correlates to risk tolerance and trust, deemed important for leadership in entrepreneurial settings. Hagenauer and Zipko (2024) document a link between high openness and extroversion and strategic risk navigation in the early phases of entrepreneurial efforts. McCarthy et al. (2023) find that key personality facets that distinguish successful entrepreneurs include a preference for variety, novelty and starting new things (openness to adventure).

⁴⁷The proposed sensitivity analysis, however, does not address the concern of post-treatment confounders. Sensi-

experience and business practices, an omitted confounder would need to explain $\sim 12\%$ and 10% , respectively, of the residual variance of the mediator and *business earnings* to completely eliminate their indirect effects, suggesting moderate robustness of these mediators. Plasticity, openness, and extroversion appear to be weakly robust. When considering 9-year business practices as an outcome, among 4-year significant mediators, business practices, plasticity, and openness are moderately robust, while business experience and extroversion are only weakly robust at best.

6.4.2 Peer Effects

Conditional on the study design’s strata, eligible youth were randomly assigned to sites (i.e., training schools) and classrooms and, as a result, to their peer groups. Peers can be defined either as their ~ 40 classmates or their ~ 160 schoolmates (four classes per school) with whom they spent the majority of their time learning and interacting during sessions and in extracurricular activities. We formally test whether *peer business experience*—as measured by baseline business ownership—and *peer quality*—exposure to peers who scored at the top of pre-training hard or soft skill assessments—inform long-term outcomes such as active business status and business earnings. In Tables A.13 and A.14, we report ITT estimates for classroom- and school-level peer effects, constructed as leave-one-out sample means of peers’ pre-training business ownership and of the proportion of top performers on pre-training knowledge tests.⁴⁸ In general, neither peers’ business experience nor quality had any statistically nor economically meaningful effects on nine-year outcomes. The only exception is a small positive effect for individuals *without prior business ownership at baseline*: a one-standard deviation (~ 10 pp) increase in the leave-one-out share of peers with pre-training business experience led to a 2.8pp increase in the likelihood of operating an active business in the long run.⁴⁹

While we do not observe post-training interactions among SEED participants, we believe there was little scope for intense and business-driven networking leading to business partnerships or systematic information exchanges. It should be mentioned that the majority of the study participants ($\sim 80\%$) pursued post-secondary education post SEED (Table 8); as such, after training, they may have been more likely to form longer and more in-depth social ties with their post-secondary

tivity analysis to post-treatment confounders as considered by Imai and Yamamoto (2013) relies on “parallel designs” or “parallel encouragement designs” that are not met in our study. To address post-treatment confounding, others have proposed weighting approaches (e.g., Huber, 2014; Hong, 2015) invoking additional identifying assumptions on the post-treatment confounder to restore identification (e.g., functional-form or independence restrictions), which can be as strong as (or stronger than) sequential ignorability.

⁴⁸Estimation details and relevant tables can be found in section A.3 in the Appendix. The reliance on the leave-one-out peer effect is consistent with traditional approaches, e.g., Carrell et al. (2009); Sacerdote (2011); Duflo et al. (2011).

⁴⁹Correlational evidence of positive peer effects in entrepreneurship has been documented extensively in the context of worker networks, university peers, and neighbors (see for instance Nanda and Sørensen, 2010; Kacperczyk, 2012; Guiso et al., 2021). Research relying on quasi-experimental variation in the peer composition of MBA sections may be closer to our setting, despite peer interactions and opportunities in SEED being much shorter (three weeks) than those over the course of traditional MBA programs. This work highlights the role of exposure to peers with entrepreneurial experience in *screening out* bad business ideas and *screening in* good ones, as well as a limited role for knowledge sharing (Abraham et al., 2024; Lerner and Malmendier, 2013).

schoolmates than with peers in their short-lived SEED network.

Further, in 2013, tools to facilitate remote connections and information-sharing were limited. In 2013, internet penetration in Uganda was only 5%, rising only to 11% in 2022 ([WDI](#), [Worldbank](#) and [ITU DataHub](#)). More informal statistics place the percentage of internet users at around 41% in 2017; with social media use at only 6%.⁵⁰ Among our study sample, at baseline, 11% of youth assigned to training reported having an email address and 16.6% reported having a Facebook account.⁵¹ We test whether exposure to SEED classmates with social media accounts (Facebook) alone or with social media or email affects long-run business formation and profitability (Table [A.15](#)). In line with previous peer effects results, most coefficients are statistically insignificant and small in magnitude. The only marginally significant coefficient indicates that a standard deviation increase in the exposure to schoolmates (but not classmates) with Facebook reduces the probability of business ownership by 1 pp.

In the absence of widespread opportunities for peer-connections through digital channels, interactions could also have been facilitated by pre-existing ties or geographical proximity. By design, treatment was stratified by school of origin. On average, 21.5 students per school of origin (that is, the secondary school at the time of the baseline) were recruited into the study; 7.8 were assigned to the same training site, representing 4.8% of the site’s ~160 participants. In each class of 40 students, an average of 2.3 youth came from the same recruitment school. After take-up decisions, the average number of youth from a given recruitment school was 5.4 per training site and 1.8 per class.

Youth assigned to treatment spanned 89 districts (or 73% of the 122 districts according to the [2014 Housing Census in Uganda](#)), 595 subcounties, and 1,353 parishes (18% of total parishes in Uganda based on the 2014 administrative data). In each class and training site, there are on average 1.04 and 1.17 youth, respectively, from the same parish, suggesting minimal geographic overlap at the beginning of the study.⁵²

In summary, the experience and quality of SEED peers did not have significant impacts on long term outcomes. We also document a limited scope for networks based on school-of-origin or geographical proximity to shape the 9-year findings. This was largely due to the nascent stage of social media and to the low internet penetration in Uganda at the time, combined with the wide geographical spread of youth recruitment. Although post-training peer dynamics cannot be fully ruled out, our data suggest that the influence of such collaborations among SEED participants

⁵⁰[Datareportal](#) aggregates data from several sources including from the United Nations, US Census Bureau, Internet World Stats, Facebook, national regulatory authorities, etc.

⁵¹16.6% is likely an upper bound on the prevalence of Facebook accounts. Many respondents reported only first names, partial information, or email addresses. When excluding incomplete/unclear information, the share of youth with Facebook accounts drops to 5.4%.

⁵²For subcounties, on average 1.18 and 1.66 youth in each class and in each site, respectively, came from the same subcounty. According to the 2014 Uganda Housing Census, the median populations of parishes and subcounties were 3,655 and 19,188, respectively. In 2015, at the time of the tracking survey and ahead of the four-year follow-up, the average number of youth who participated in the SEED from the same class (training site) residing in the same subcounty was 1.21 (1.64). These figures highlight that geographic sparsity of youth persisted even after training. Tracking data available to the PI team had some limitations. Of the 3,522 observations in the 2015 tracking survey, 1,300 had missing geographical information or could not be mapped to existing administrative units.

was likely limited and not large enough to account for overall program impacts.⁵³ For peer effects alone to account for SEED’s impacts, they would need to be of a magnitude comparable to those of programs specifically designed to build business networks, form collaborations, and facilitate information sharing. These typically last longer, between four and ten months, and feature repeated structured interactions among participants, with the goal of fostering information sharing (e.g., [Cai and Szeidl \(2018\)](#) and [Asiedu et al. \(2023\)](#)). Overall, these interventions involve more sustained and denser peer interactions than those that may have emerged during the brief 3-week training, where any network formation would have been organic and forged via class/training site interactions.

6.5 Spillovers: Labor Market Outcomes and Education Investments

Labor Market. Four years after the intervention, SEED graduates demonstrated better knowledge of hard and soft skills and personality traits to succeed as entrepreneurs. They were also more likely to start businesses that survive over time and have higher-quality ventures. A complementary set of outcomes relates to the extent to which upgrades in entrepreneurial mindset and skills are rewarded in the traditional labor (wage) market, which employed 43.2% and 55.6% of the control group at the 4- and 9-year follow-ups, respectively (Table 12).

At the time of the *4-year survey*, not only were the hard and soft treatment groups more likely to own an active business, but they were also economically active at higher rates, with hard and soft skill treatment groups participating at 4.9 pp (7.7%) and 3.8 pp (5.9%) higher rates than the control group, respectively. Furthermore, SEED graduates were more likely to be contemporaneously self-employed and work for someone else (SEED hard: 2.4 pp; SEED soft: 2.5 pp), but just as likely to be wage workers as their counterparts in the control group. The attenuated impacts on the extensive margin of labor market participation were accompanied by insignificant wage earnings effects for the two curricula.

Five years later (*9-year survey*), participation in the wage sector expanded to 55.6% for the control group (a 12 pp increase), a more modest growth compared to the increase in self-employment (4-year: 27.6%; 9-year: 58.3%). In line with the medium run results, the two SEED curricula did not lead to gains in participation in the labor market, nor in wage earnings (Table 12b). The effects on the extensive margin of labor market participation are statistically insignificant; we also did not observe significant impacts on wage earnings (SEED hard: \$42.96 or 9.4%; SEED soft: \$27.01 or 5.9%). Youth in the treatment and control groups are also equally likely to work for someone else, as well as to be jointly self-employed and work for someone else.

Combining wage and business earnings, we can turn our attention to *Total Earnings* (Table 12, Column 5). The 4-year estimates are noisy, while the long term follow-up yields a more precise picture: the intervention delivered meaningful and significant gains in total monthly earnings (SEED hard: \$120.81 or 13.1%; SEED soft: \$112.1 or 12.2%) which correspond to roughly 1.5 extra months of total yearly earnings relative to the control group.

⁵³It is important to note that our results do not speak to the possibility that SEED participants altered the size of their networks, or changed their sources of information and advice relative to the control group.

Education. As noted earlier, expressions of interest in the SEED program and the baseline took place in October 2012, the month prior to their final upper secondary examinations (S6) and the mini MBAs were delivered in May 2013, when most of the students had already made decisions about their tertiary education. Approximately 70% of study participants at baseline stated that they had plans to attend university. As such, we should not expect the intervention to shape investments in higher education. This conjecture is corroborated by Table 8. SEED participants and their control group counterparts were equally likely to be enrolled in post-secondary school at the 4-year follow-up (52% of the study sample was enrolled in post-secondary); they were also equally likely to have attended some post-secondary (78.8%) or completed post-secondary education (72.6%) at the time of the 9-year follow-up.⁵⁴ These null effects serve to dispel concerns that the program may have adversely affected investments in human capital by drawing youth away from post-secondary education.

7 Return on Investment

We measure return on investment as the present discounted value of the increase in business profits and total earnings from training divided by investment, the cost of the training.

7.1 Intervention Costs and Effect Sizes

Total intervention costs were estimated at \$143.13 per student (expressed in 2021 USD, in order to be comparable to the earnings figures).⁵⁵ At the 9-year follow-up, SEED graduates earned an additional \$75.40 (pooled) per month relative to the control group (roughly 16% more), such that the control group would need to work two additional months annually to match the yearly earnings of the treatment groups.

SEED compares favorably in terms of both costs and effect sizes to other programs. Based on McKenzie (2021)’s random effects meta-analysis, traditional (hard skills only) training programs yield positive average effects on profits (10.1%). The costs of these programs range from \$400 to \$12,242 for a class of 20, with an average of \$3,537, or \$177 per participant. For a firm earning \$100 a month, a 10% increase in profits would recover the \$177 cost of the training in 18 months (McKenzie et al., 2020). Campos et al. (2017)’s personal initiative training, which is more directly comparable to the SEED curricula, cost \$756 per invited participant and yielded a \$60-per-month increase in monthly profits during the first two years.

⁵⁴At the 4-year survey, 63.9% of control group participants were engaged in an economic activity. 80% of inactive youth in the control group were in school, and 7.32% were looking for a job.

⁵⁵\$143.13 is the cost per student assigned to treatment; \$209.39 is the cost per student who took up treatment. Total costs included salaries and benefits for trained teachers (10%), curriculum development and testing (2%), teacher recruitment and training (4%), site management staff costs (4%), venue, transport, meal, staff plus other students costs (67%), training materials and supplies (5%), supervision and support to teachers (2%), and administration country office (5%).

7.2 Present Discounted Value

To quantify the added profits generated by SEED, we calculate the *present discounted value (PDV)* of the extra business earnings associated with the two SEED curricula. Consistent with similar calculations, we adopt a 10% discount rate.⁵⁶ To compute the PDV, we also need to make assumptions about the temporal evolution of SEED’s effects on profits for those periods during which program impacts are not measured: i.e., before the 4-year and after the 9-year follow-ups, and between the two follow-ups.

We assume that program effects (i) did not emerge until year four (the medium run follow-up) and (ii) that effect sizes between years four and nine grew at a constant annual rate.⁵⁷ Assuming further that impacts remained constant from year nine to year 15 and were zero thereafter, the PDVs of incremental SEED-induced business and total earnings are \$2,892.64 and \$3,882.56, respectively (Table 13). Relative to program costs of \$143.13 per youth assigned to treatment, SEED generated returns of 20.17 and 27.07 times the initial investment.⁵⁸

Our PDV setup is intentionally conservative. By comparison, Duflo et al. (2024) model the first-generation labor market benefits of secondary school subsidies in Ghana as a stream of income beginning at 31 years of age and continuing for the remainder of the working lives of study participants (34 years), assuming that program benefits measured at age 31 continue throughout the period.⁵⁹

This section adopts a limited measure of benefits – monthly total/business earnings – which abstracts from other benefits, including any impacts on mental well-being, or job creation or resulting from possible social spillovers, all of which are difficult to monetize. However, the non-monetary benefits of such skills training programs – and of SEED training, in particular – can be quite sizable.⁶⁰

⁵⁶An annual discount rate of 10% is consistent with the median interest rate in Uganda during the 2013-2021 period. A comparable interest rate was also employed by Hamory et al. (2021) during 1998–2018 in Kenya for a similar calculation. The authors deemed 10% a conservative rate since other potential funders (e.g., international donors) would face lower rates.

⁵⁷Between the 4- and 9-year follow-ups, the implied annual growth rates of effect sizes (ITT) on business and total earnings are 49.53% and 96.59%, respectively. See Table 14 and Table A.16 in the Appendix.

⁵⁸Return on investment (ROI) computed using intent-to-treat (ITT) and local average treatment (LATE) estimates are very similar – 19.33 for business earnings and 27.05 for total earnings. Because the compliance rates for the surveyed samples differ between the 4- and 9-year waves, equality between ROI LATE and ROI ITT does not hold exactly.

⁵⁹Even if, implausibly, we assume zero impact until year nine, when we first detect statistically significant earnings effects, the program would still deliver an ROI of ~14x and ~22x for business and total earnings, respectively (see Appendix Table A.17). We consider it implausible to assume that no effects emerged until year nine, when earnings impacts would have discontinuously become positive.

⁶⁰A medium run evaluation of another secondary school social leadership intervention points to substantial social spillovers including delayed family formation, lower incidence of risky behaviors, shifts in gender-related social norms, and reductions in intimate partner violence (Chioda et al., 2023). See also Ashraf et al. (2025).

8 Concluding Remarks

We study the long and medium term impacts of SEED, which was implemented as an at-scale RCT in Uganda. SEED is an innovative in-residence 3-week mini-MBA modeled after business school curricula. The program featured two separate treatments, with the hard skills MBA featuring a mix of approximately 75% hard skills and 25% soft skills and the soft skills curriculum having the reverse mix. This work offers rare insights into both the longitudinal impacts of entrepreneurship training and the life trajectories of program graduates over a decade-long horizon.

SEED training was successful not only in jump-starting youth’s human capital accumulation (both soft and hard skills), but also in setting them on higher earnings trajectories and expanding their economic opportunities. In particular, without sacrificing their educational investments, youth in treatment groups started their economic lives (as proxied by the economic activity rate in the 4-year survey) earlier and engaged in both the wage and self-employment sectors at higher rates. In terms of entrepreneurial endeavors, they were more likely to establish new ventures and own more businesses. In the long run (9-year follow-up), treatment and control groups converged on the extensive margin of economic participation in either the wage sector or self-employment; however, SEED graduates continued to run higher quality firms (e.g., have a business partner and paid employees), that were larger in scale and more profitable. Adopting a production function framework, SEED participants achieved higher output without significant capital deepening or labor expansion relative to the control group, though with some reallocation from unpaid to paid workers. These patterns are consistent with an increase in total factor productivity associated with more effective use of inputs, rather than higher input levels or changes in returns to scale. This growth in productivity coincides with the adoption of better business practices, echoing [Bloom et al. \(2013\)](#) and [Iacovone et al. \(2022\)](#) who find that improvements in business management practices led to increased firm productivity and efficiency.

The paper provides a nuanced reinterpretation of the idea that entrepreneurship is a process of trial-and-error and learning-by-doing ([Schumpeter, 1911](#); [Manso, 2016](#)). Causal mediation offers insight into the production function of successful businesses, bridging the managerial practice and soft skills approaches and offering guidance for curriculum design. Profitable ventures appear to be built through a combination of experience/experimentation and good business practices, with soft skills and entrepreneurial mindset playing a complementary role.

The analysis of the mechanisms underlying acquisition of business practices reveals that business experimentation *alone* does not enable entrepreneurs to converge on the efficient business practices essential for their success. The adoption of good business practices in the long run is directly shaped by the knowledge, skills (both soft and hard), and know-how imparted by training. The indirect effects of mediators (entrepreneurial mindset–plasticity–, previously adopted business practices, experience) are modest and dwarfed by direct SEED effects. In summary, experience alone may not be sufficient, nor are nor soft skills; the ability to learn the right approaches to business management and to do so effectively is also paramount ([Rosen, 1972](#); [Thompson, 2010](#); [Lafontaine and Shaw, 2016](#)).

In the long run, we find no systematic differences in outcomes between the hard- and soft-skills curricula. Both groups were exposed to the same business plan curriculum, which may have attenuated differences across treatments. Moreover, the two curricula may have endowed youth with a sufficient combination of hard and soft skills that they achieved similar entrepreneurial success nine years post training.

Our results suggest that SEED graduates behaved like *transformational / opportunity entrepreneurs* (as in [Schoar, 2010](#)). The intervention was highly cost-effective and compares favorably with existing training alternatives that tend to be more expensive and often yield lower benefits. The scale of the study and the geographic distribution of its sample are unlikely to have generated spillovers related to general equilibrium effects. Indeed, while SEED led to earlier and greater numbers of business starts, as well as more entrepreneurial experience, the treatment and control groups engaged in entrepreneurship at comparable rates in the long run, suggesting that the control group was not excluded from starting businesses as a result of the program.⁶¹

Two critical program features support SEED’s effectiveness. First, SEED was designed and implemented as a high quality intervention. The curricula were informed by rigorous evidence from the economic and psychology literatures. Furthermore, instructors received extensive and premium training on teaching methods, as well as on soft and hard skills knowledge. Implicitly, our results corroborate the proposition that first-rate teacher and youth trainings can be delivered at relatively low costs.

Second, SEED targeted youth at the end of secondary school, which is earlier in life than traditional training interventions. The period of adolescence through the mid-20s represents a critical stage of brain development, featuring significant degrees of plasticity in those areas of the brain that are responsible for the regulation of automatic or instinctive reactions, risk-taking behavior, self-control, reflective reasoning, communication, among others. In fact, research increasingly points to youth as the key phase during which those skills that are at the core of transformational entrepreneurship can be shaped.

It is also worth highlighting that youth in our study are characterized by high ability and motivation. They were in their last year of secondary school and many of them planned to attend university, both of which correlate with higher ability. However, they came from modest backgrounds, with ambitions to become first-generation post-secondary learners. They became economically active around 14.5 years old.; their parents had limited post-secondary education (73% of mothers and 60% of fathers) and were primarily employed in low-skill manual jobs.

Furthermore, our sample is self-selected for high interest and motivation to learn entrepreneurship. Our results for individuals with higher potential and motivation echo calls for better targeting emerging from recent work. The lack of significant effects for business training or workforce programs has led some authors to examine impact heterogeneity and conclude that more careful

⁶¹The scale of the intervention, its short duration, small class sizes, and the still-limited use of online and social media tools contribute to our view that the program was unlikely to have generated network effects, whereby classmates would have served as sources of advice ([Chatterji et al., 2019](#)), business partners/employers ([Rocha and Andrew Brymer, 2025](#)), and/or benchmarks ([Shue, 2013](#)).

targeting of businesses and/or youth could improve the impacts of these programs and mitigate unintended consequences (e.g., [Blimpo and Pugatch, 2023](#); [Bertrand et al., 2021](#), and citations therein). The efficacy of SEED for youth with lower levels of education/ability remains untested and is an avenue we plan to explore in future work.

Several important questions remain, especially regarding the temporal evolution of SEED’s impacts. As [McKenzie and Woodruff \(2017\)](#) points out, most of the existing literature on business training does not examine the effects of training at different points in time. The few exceptions indicate that some effects disappear in the longer term (e.g., [Blattman, Fiala, and Martinez, 2020](#); [Blattman, Dercon, and Franklin, 2019](#); [Alaref, Brodmann, and Premand, 2020](#)), however, in some instances, impacts may reemerge over the life cycle ([Fiala et al., 2025](#)). Furthermore, while SEED explicitly features soft skills (with two distinct intensities) as one of the centerpieces of its curriculum, we only observe differences between the two treatment arms for interpersonal skills and self-efficacy, but no overall statistical differences for economic outcomes. Will these patterns persist, or are returns to interpersonal skills just slower to emerge? SEED-like interventions call for future research to gain insight into their optimal timing (how late or how early can these skills be taught?), into their complementarities with other initiatives (e.g., start-up capital, digital skills), and into potential social spillovers of these skills on noneconomic outcomes (e.g., gender empowerment).

Between 2010 and 2030, global labor markets will need to generate roughly three quarters of a billion new jobs ([Bloom et al., 2018](#)), an especially daunting task in light of growing young populations and often underperforming education systems – themselves under additional stress during the recent pandemic. As noted in [Sumberg et al. \(2021\)](#), entrepreneurship is becoming a necessity in developing countries and is called upon to play a dual role: to promote growth and to absorb a persistently high share of employment. As a result, training programs designed to “make” transformational entrepreneurs capable of generating positive ripple effects for the economy are critical investments to face this development challenge.

A Tables and Figures

A.1 Study Design and Curricula

Figure 1: Experimental Design

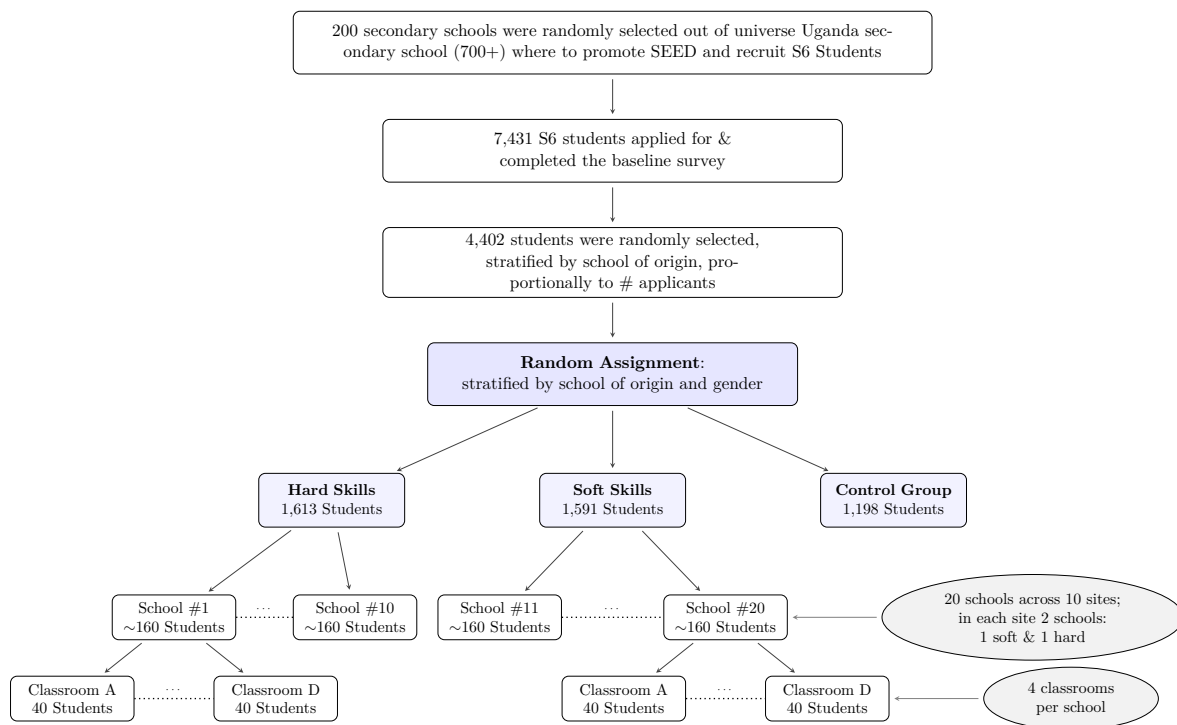


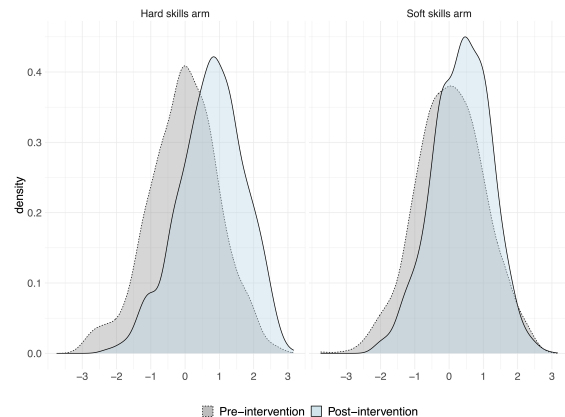
Table 1: Lesson Plans for Soft and Hard Curricula

SEED Curricula: Lesson Plans		
HARD SKILLS	SOFT SKILLS	BUSINESS PLAN
1. Defining Entrepreneurship	1. Defining Entrepreneurship	1. Entrepreneurship in Society
2. Self-Employment	2. Entrepreneurial Identity	2. Thinking about Business
3. Generating Business Ideas	3. Self-Management	3. Evaluating Starting an Enterprise
4. Identifying Business Opportunities	4. Identifying Business Opportunities	4. Business Planning Overview
5. Selecting a Suitable Market	5. Communication	5. Skills/Resources needed
6. Ways of Getting into Business	6. Win-Win Judgment	6. Market Research
7. Legal Forms of Business Ownership	7. Personal Power	7. Coffee Shop Case Study, Part 1
8. Hiring and Managing People	8. Negotiation Simulation	8. Taxes & Legal Responsibilities
9. Knowing the Cost of an Enterprise	9. Leadership and Team Building	9. Coffee Shop Case Study, Part 2
10. Money Needed to Start an Enterprise	10. Goal setting	10. Financial Planning
11. Obtaining Money to Start an Enterprise	11. Decision Making Skills	11. Fundraising
12. Managing Money	12. Group Decision Making	12. Marketing
13. Investment Simulation	13. Risk-Taking	13. Confidence & Executive Summary
14. Using Financial Statements	14. Social Networking	14. Persuasion & Business Plan Pitch
15. Managing Sales	15. Public Speaking	15. Pitching your Business Plan
16. Selecting Suppliers	16. Formal Presentations of Business Plan	
17. Using Technology in Small Business	17. Using Technology in Small Business	

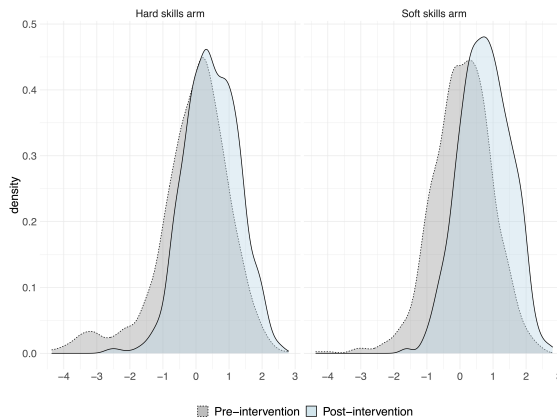
A.2 Tables: Skills and Personality Traits - 4y Follow-up

Figure 2: Pre- and Post-Training Knowledge Assessments, by Treatment Arm

(a) Hard Skills Knowledge Test Scores (z-score)



(b) Soft Skills Knowledge Test Scores (z-score)



Note: Test scores on hard and soft skills assessments for the two treatment groups are standardized with respect to each treatment arm's mean and standard deviation of pre-training test scores.

Table 2: Post-Training Knowledge Test Scores

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Hard Skills Assessment (sd)				Soft Skills Assessment (sd)			
Soft Skills Treatment								
β	-0.40***	-0.43***	-0.42***	-0.41***	0.28***	0.25***	0.26***	0.28***
se	0.041	0.035	0.033	0.024	0.035	0.034	0.032	0.023
Mean of Hard Skills Group	0.761				0.465			
Observations	1959	1959	1959	1959	1959	1959	1959	1959
Pre-training Knowledge score	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Student characteristics	No	No	Yes	Yes	No	No	Yes	Yes
DML	No	No	No	Yes	No	No	No	Yes

Note: The sample is restricted only to SEED participants. The table reports estimates from regressions of test scores of hard (soft) skills knowledge on a dummy variable for the soft SEED group and a constant. Test scores for the hard and soft skills assessments post intervention are standardized with respect to knowledge assessment test scores performed prior to training. The mean of the hard skills group corresponds to the average post-training test score for youth in the hard skill treatment. All specifications are OLS regressions, with the exception of columns (4) and (8) report DML (Chernozhukov et al., 2018) estimates. Standard errors are reported below the point estimates. Asterisks correspond to two-sided tests.

Table 3: Hard Skills Knowledge, 4y Follow-up

		(1)	(2)	(3)	(4)	(5)	(6)
		Generating Business Ideas	Effects of Competition	Cost Categorization	Utility of Record Keeping	Profit/Loss Statement	Hard Skills Knowledge Index
Hard skills	β	0.117***	0.061*	0.129***	0.029	-0.015	0.116***
	se	[0.041]	[0.041]	[0.041]	[0.041]	[0.041]	[0.040]
	<i>p</i> -value	0.002	0.066	0.001	0.237	0.643	0.002
Soft skills	β	0.130***	0.138***	0.064*	-0.009	0.012	0.103***
	se	[0.041]	[0.041]	[0.041]	[0.041]	[0.041]	[0.041]
	<i>p</i> -value	0.001	0.000	0.059	0.587	0.386	0.006
Mean control group		0.000	0.000	0.000	0.000	0.000	0.000
<i>p</i> -value Hard skills = Soft skills		0.830	0.181	0.256	0.507	0.643	0.817
Observations		3890	3890	3890	3890	3890	3890

Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors across splits are calculated with the median method as in [Chernozhukov et al. \(2018\)](#). *p*-values are one-sided. Column (6) is an [Anderson \(2008\)](#)-style index, whose components are columns (1)–(5).

Table 4: Negotiation: Payoff Tables

Buyer (Enumerator): Musumba Payoff Table				Seller (Subject): Butagira Payoff Table			
Financing		Project Start		Financing		Project Start	
Paid Down Payment UGX, millions	Points	Start Date	Points	Received Down Payment UGX, millions	Points	Start Date	Points
100	500	2 months	1000	100	0	2 months	0
150	450	3 months	900	150	100	3 months	50
200	400	4 months	800	200	200	4 months	100
250	350	5 months	700	250	300	5 months	150
300	300	6 months	600	300	400	6 months	200
350	250	7 months	500	350	500	7 months	250
400	200	8 months	400	400	600	8 months	300
450	150	9 months	300	450	700	9 months	350
500	100	10 months	200	500	800	10 months	400
550	50	11 months	100	550	900	11 months	450
600	0	12 months	0	600	1000	12 months	500

Note: The Seller, the respondent, prefers a full payment, UGX 600 million, up front and a delayed project start date; the Seller places more weight on the financing arrangement than on the start date. The Buyer prefers a small down payment, but an early start date; the buyer assigns a higher weight to the start date than to the financing arrangements.

Table 5: Task-Based Measures: Negotiation and Persuasion, 4y Follow-up

		(1)	(2)	(3)	(4)	(5)	(6)
		Negotiation			Persuasion		Negotiation & Persuasion Index
		Agreement Final Offer	Agreement down payment (million)	Agreement start date (months)	How convincing	Would like to hire	
Hard skills	β	-0.028*	0.021	0.036	0.007	0.003	0.012
	se	[0.017]	[0.019]	[0.033]	[0.006]	[0.007]	[0.043]
	<i>p</i> -value	0.095	0.275	0.282	0.127	0.317	0.392
Soft skills	β	-0.024	0.043**	0.078**	0.015**	0.016**	0.079**
	se	[0.017]	[0.018]	[0.032]	[0.007]	[0.008]	[0.043]
	<i>p</i> -value	0.163	0.019	0.016	0.017	0.019	0.033
Mean control group		0.813	375	4.674	0.022	0.026	0.000
<i>p</i> -value Hard skills = Soft skills		0.849	0.225	0.203	0.453	0.224	0.267
Observations		3,701	3,701	3,701	3,716	3,716	3,560

Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors across splits are calculated with the median method across splits as in [Chernozhukov et al. \(2018\)](#). *p*-values for Negotiation are two-sided; those for all other outcomes are one-sided. Outcomes in columns (1), (4) and (5) are dichotomous variables. Negotiation outcomes, in columns (2) and (3), are weakly positive and were estimated with Poisson with double selection (Lasso) as in [Belloni et al. \(2016\)](#), with the DoubleML package for Generalized Linear Models. Mean control group values are in UGX millions for Column (2) and months for column (3). Poisson regression coefficients require exponentiation to obtain percentage changes (e.g., $\exp(\beta) = \exp(0.078) = 1.081$ or 8.1% and $\exp(0.043) = 1.044$ or 4.4%). The Negotiation and Persuasion index corresponds to the [Anderson \(2008\)](#) index computed using columns (1)–(5). The index requires non-missing observations for both Negotiation and Persuasion, resulting in a smaller sample size (3,560) than that of each component (3,701 and 3,716, respectively).

Table 6: Soft Skills / Personality Traits, 4y Follow-up

		(1)	(2)	(3)	(4)	(5)
		Plasticity	Stability	Self-efficacy	Stress	Soft Skills Index
Hard skills	β	0.114***	0.142***	0.040	-0.226***	0.222***
	se	[0.039]	[0.039]	[0.040]	[0.039]	[0.039]
	<i>p</i> -value	0.002	0.000	0.157	0.000	0.000
Soft skills	β	0.138***	0.095***	0.079**	-0.191***	0.205***
	se	[0.039]	[0.040]	[0.040]	[0.040]	[0.039]
	<i>p</i> -value	0.000	0.008	0.023	0.000	0.000
Mean control group		0.000	0.000	0.000	0.000	0.000
<i>p</i> -value Hard skills = Soft skills		0.666	0.398	0.484	0.525	0.752
Observations		3890	3890	3890	3890	3890

Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors across splits are calculated with the median method, as in [Chernozhukov et al. \(2018\)](#). *p*-values are one-sided. Plasticity and Stability correspond to the Big Five metatraits: Stability combines Emotional Stability, Agreeableness, and Conscientiousness; Plasticity combines Extroversion and Openness. All Dependent variables are normalized with respect to the mean and standard deviation of the control group. Column (5) is an [Anderson \(2008\)](#)-style index, whose components are columns (1)–(4).

A.3 Tables: Economic Outcomes 4- and 9-year Follow-ups

Table 7: Entrepreneurial History and Experience, 4y Follow-up

		(1)	(2)	(3)	(4)
		Ever Started a Business	Number of Business Starts	Cumulative Number of Months Running a Business	Business Experience Index
Hard skills	β	0.102***	0.109***	2.561***	0.202***
	se	[0.020]	[0.035]	[0.628]	[0.040]
	<i>p</i> -value	0.000	0.001	0.000	0.000
Soft skills	β	0.108***	0.136***	2.544***	0.214***
	se	[0.020]	[0.035]	[0.616]	[0.040]
	<i>p</i> -value	0.000	0.000	0.000	0.000
Pooled	β	0.104***	0.121***	2.546***	0.208***
	se	[0.018]	[0.031]	[0.552]	[0.036]
	<i>p</i> -value	0.000	0.000	0.000	0.000
Mean control group		0.474	0.434	9.790	0.00
<i>p</i> -value Hard skills = Soft skills		0.815	0.598	0.985	0.833
Observations		3,890	3,890	3,890	3,890

Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors are calculated with the median method across splits as in Chernozhukov et al. (2018). *p*-values are one-sided. In the 9-year survey, the questions about retrospective business starts and experience were not asked out of a need for parsimony, since it was implemented as a phone survey in response to the Covid pandemic.

Table 8: Education Investments at 4y and 9y Follow-ups

		(1)	(2)	(3)
		Enrolled in Post-secondary (4y)	Any Post-secondary (9y)	Complete Post-secondary (9y)
Hard skills	β	-0.019	-0.008	0.003
	se	0.020	0.018	0.019
	<i>p</i> -value	0.337	0.646	0.859
Soft skills	β	0.004	0.013	0.012
	se	0.020	0.017	0.019
	<i>p</i> -value	0.843	0.466	0.530
Mean control group		0.523	0.788	0.726
<i>p</i> -value Hard skills = Soft skills		0.413	0.402	0.751
Observations		3,890	3,396	3,396

Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors are calculated with the median method across splits as in Chernozhukov et al. (2018). *p*-values are two-sided, given the ambiguous theoretical direction of effects on education investment. All dependent variables are dichotomous. *Any (Completed) post-secondary* corresponds to a dummy variable equal to one if the study participant attended any (completed) post-secondary education at the time of the 9-year survey.

Table 9: Active Businesses and their Characteristics

(a) Active Business: Characteristics, 4y Follow-up								
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Active Business	Number of Active Businesses	Median Age (months)	Formal Business	Have Partners	Have Employees	Business Quality Index
Hard skills	β	0.041**	0.056***	1.590***	0.007	0.019**	0.042**	0.055
	se	[0.019]	[0.021]	[0.433]	[0.014]	[0.011]	[0.018]	[0.043]
	<i>p</i> -value	0.013	0.005	0.000	0.312	0.040	0.012	0.101
Soft skills	β	0.060***	0.071***	1.533***	0.023**	0.032***	0.060***	0.116***
	se	[0.019]	[0.021]	[0.428]	[0.014]	[0.011]	[0.019]	[0.044]
	<i>p</i> -value	0.001	0.000	0.000	0.048	0.002	0.001	0.004
Pooled	β	0.050***	0.063***	1.552***	0.015	0.025***	0.050***	0.084**
	se	[0.016]	[0.019]	[0.382]	[0.012]	[0.010]	[0.016]	[0.038]
	<i>p</i> -value	0.001	0.000	0.000	0.113	0.004	0.001	0.013
Mean control group		0.276	0.298	6.733	0.122	0.067	0.274	0.000
<i>p</i> -value Hard skills = Soft skills		0.479	0.604	0.925	0.396	0.413	0.498	0.320
Observations		3,890	3,890	3,890	3,890	3,890	3,890	3,890

(b) Active Business: Characteristics, 9y Follow-up								
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Active Business	Number of Active Businesses	Median Age (months)	Formal Business	Have Partners	Have Employees	Business Quality Index
Hard skills	β	0.019	0.049*	0.077	0.025	0.017	0.030*	0.079**
	se	[0.022]	[0.032]	[1.229]	[0.021]	[0.014]	[0.021]	[0.045]
	<i>p</i> -value	0.193	0.062	0.475	0.120	0.106	0.076	0.038
Soft skills	β	-0.002	0.031	-0.109	0.016	0.024**	0.020	0.071*
	se	[0.022]	[0.032]	[1.278]	[0.021]	[0.014]	[0.021]	[0.045]
	<i>p</i> -value	0.535	0.165	0.534	0.229	0.044	0.178	0.059
Pooled	β	0.008	0.039*	-0.015	0.020	0.021**	0.034	0.074**
	se	[0.019]	[0.028]	[1.120]	[0.019]	[0.012]	[0.019]	[0.040]
	<i>p</i> -value	0.334	0.086	0.506	0.143	0.047	0.103	0.031
Mean control group		0.583	0.720	21.116	0.338	0.101	0.406	0.000
<i>p</i> -value Hard skills = Soft skills		0.501	0.699	0.916	0.724	0.896	0.599	0.832
Observations		3,396	3,396	3,396	3,396	3,396	3,396	3,396

Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors are calculated with the median method across splits as in [Chernozhukov et al. \(2018\)](#). *p*-values are one-sided. The dependent variable in column (1) is an indicator for whether subject *i* owns an active business, those in columns (4)–(6) are dichotomous. Outcomes in columns (2)–(6) are not conditional on employment status; they are defined as the joint outcome of owning a business and the relevant outcome variable. A formal business is one that is either registered or paying taxes. The 9y follow-up survey distinguished between salaried and non-salaried employees (Table [A.11](#) in the Appendix reports results for salaried employees), while the 4y survey cannot distinguish between the two types. Column (7) is an [Anderson \(2008\)](#)-style index, whose components are columns (4)–(6).

Table 10: Business Practices

(a) Business Practices, 4y						
		(1)	(2)	(3)	(4)	(5)
		Competition Practices	Business Management	Fintech Adoption	Technology Adoption	Business Practice Index
Hard skills	β	0.175***	0.130***			0.175***
	se	[0.043]	[0.040]			[0.042]
	<i>p</i> -value	0.000	0.001			0.000
Soft skills	β	0.126***	0.181***			0.179***
	se	[0.042]	[0.040]			[0.041]
	<i>p</i> -value	0.001	0.000			0.000
Pooled	β	0.149***	0.155***			0.175***
	se	[0.037]	[0.036]			[0.037]
	<i>p</i> -value	0.000	0.000			0.000
Mean control group		0.000	0.000			0.000
<i>p</i> -value Hard skills = Soft skills		0.410	0.369			0.948
Observations		3,890	3,890			3,890

(b) Business Practices, 9y						
		(1)	(2)	(3)	(4)	(5)
		Competition Practices	Business Management	Fintech Adoption	Technology Adoption	Business Practices Index
Hard skills	β	0.105***	0.102***	0.099**	0.099**	0.127***
	se	[0.043]	[0.043]	[0.044]	[0.045]	[0.044]
	<i>p</i> -value	0.008	0.009	0.012	0.014	0.002
Soft skills	β	0.080**	0.060*	0.073**	0.080**	0.085**
	se	[0.044]	[0.043]	[0.044]	[0.045]	[0.044]
	<i>p</i> -value	0.035	0.082	0.050	0.037	0.027
Pooled	β	0.093***	0.082**	0.088**	0.089**	0.106***
	se	[0.039]	[0.039]	[0.039]	[0.040]	[0.039]
	<i>p</i> -value	0.009	0.018	0.013	0.013	0.003
Mean control group		0.000	0.000	0.000	0.000	0.000
<i>p</i> -value Hard skills = Soft skills		0.681	0.501	0.672	0.775	0.500
Observations		3,396	3,396	3,396	3,396	3,396

Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors are calculated with the median method across splits as in [Chernozhukov et al. \(2018\)](#). *p*-values are one-sided. Outcomes in columns (1)–(5) are [Anderson \(2008\)](#)-style indexes. The *Business Practices Index* is also [Anderson \(2008\)](#)-style index which combines yes/no answers for managerial practices spanning the following dimensions: competition, business management, fintech, and technology adoption. Competition practices capture whether respondents visit competitors, advertise their businesses, negotiate with suppliers, compare quality and prices of goods/services across suppliers; *Business management* aggregates answers relating to whether respondents keep business records, are in charge of businesses' financial and HR decisions (hiring/firing); *Fintech Adoption* captures the reliance for business purposes on digital payments and mobile money in conjunction with business technology to handle business transactions (receive payments, paying employees, suppliers, loans, taxes); *Technology Adoption* includes responses as to whether respondents used any IT solutions to manage the business and whether they kept digital financial records. Fintech and tech Adoption questions were asked only in the 9-year survey.

Table 11: Business Performance, Business (Monthly) Earnings, and Inputs

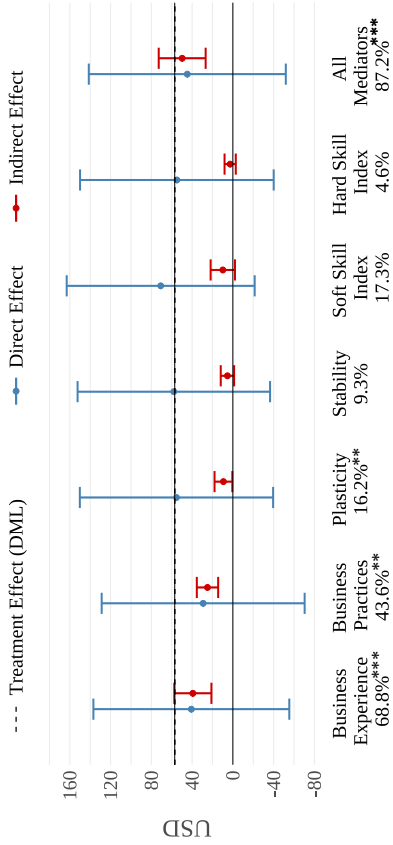
(a) Business Performance and Earnings, 4y Follow-up							
		(1)	(2)	(3)	(4)	(5)	(6)
		Business Revenue	Business Earnings	Profit Margin	Number of Employees	Capital	Return to Capital
Hard skills	β	20.682	7.885	0.020***	0.222*	-128.548	-2.172
	se	[39.076]	[19.297]	[0.011]	[0.149]	[125.668]	[1.509]
	p -value	0.298	0.341	0.000	0.068	0.847	0.925
Soft skills	β	16.388	13.816	0.036***	0.261**	-76.730	-1.075
	se	[38.473]	[19.329]	[0.012]	[0.140]	[124.959]	[1.717]
	p -value	0.335	0.237	0.000	0.031	0.730	0.734
Pooled	β	16.950	10.085	0.027***	0.233**	-102.175	-1.467
	se	[34.810]	[17.242]	[0.010]	[0.130]	[113.863]	[1.482]
	p -value	0.313	0.279	0.000	0.036	0.815	0.839
Mean control group		295.781	145.959	0.143	1.390	760.729	4.449
p -value Hard skills = Soft skills		0.938	0.828	0.318	0.846	0.770	0.631
Observations		3,890	3,890	3,890	3,890	3,890	3,890

(b) Business Performance and Earnings, 9y Follow-up							
		(1)	(2)	(3)	(4)	(5)	(6)
		Business Revenue	Business Earnings	Profit Margin	Number of Employees	Capital	Return to Capital
Hard skills	β	216.446**	74.457*	-0.002	0.021	457.653	0.138**
	se	[111.916]	[50.566]	[0.021]	[0.213]	[482.653]	[0.079]
	p -value	0.027	0.070	0.539	0.460	0.172	0.040
Soft skills	β	195.164**	78.402*	-0.017	0.028	160.197	0.138**
	se	[113.365]	[52.140]	[0.0228]	[0.218]	[478.298]	[0.070]
	p -value	0.043	0.066	0.768	0.449	0.369	0.024
Pooled	β	205.264**	75.401**	-0.011	0.017	309.189	0.135***
	se	[98.953]	[45.348]	[0.020]	[0.200]	[423.235]	[0.056]
	p -value	0.019	0.048	0.714	0.466	0.2325	0.008
Mean control group		1,044.574	472.003	0.295	1.731	3,231.389	0.154
p -value Hard skills = Soft skills		0.894	0.957	0.636	0.983	0.662	1.000
Observations		3,396	3,396	3,396	3,396	3,396	3,396

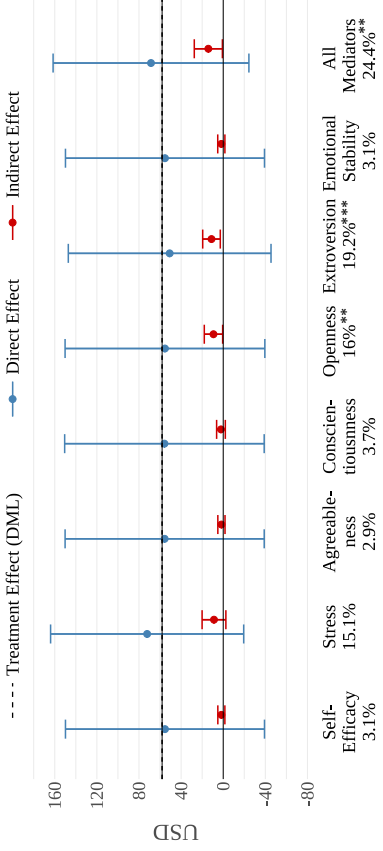
Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors are calculated with the median method across splits as in Chernozhukov et al. (2018). p -values are one-sided. All variables except Return to Capital and Number of Employees are expressed in 2021 PPP adjusted US dollars. Outcomes in all columns are not conditional on employment status; they are defined as the joint outcome of owning a business and the relevant variables. Financial variables are winsorized at the 97th percentile with respect to their distribution conditional on employment status. Survey questions to capture business capital were modified between the 4y and 9y follow-ups. The 4-year survey question was: *What is the approximate total cash value of all machines, equipment, supplies, land, and tools that you own for your business?* The 9-year survey question was: *What is the resale value of equipment, land, and building (used in the operation of the business)?*

Figure 3: Mechanism: Direct and Indirect Effects

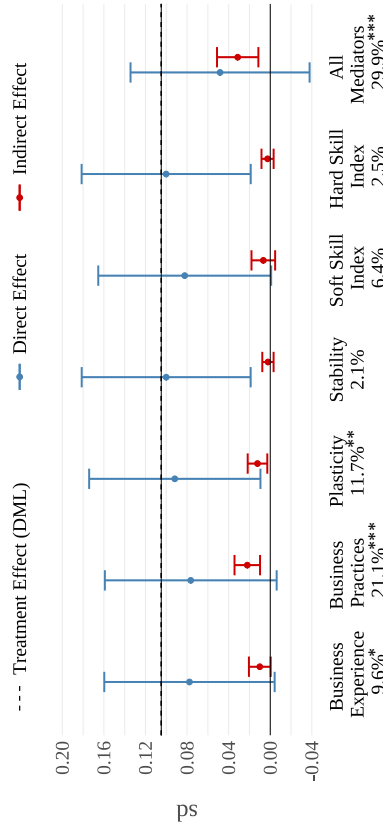
(a) 9y Business Earnings, 4y All Mediators



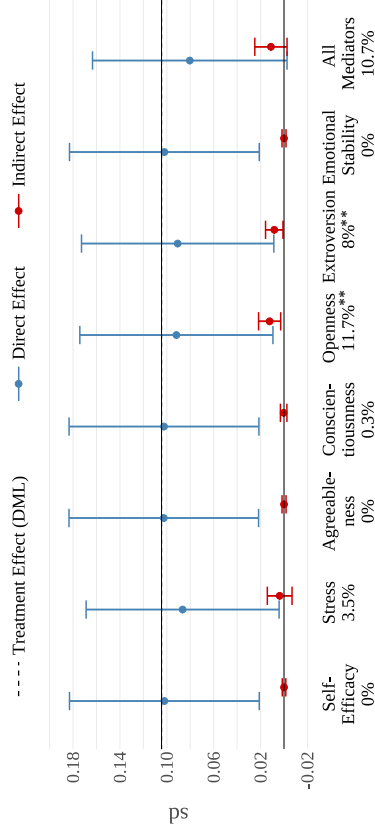
(b) 9y Business Earnings, 4y Soft Skills Mediators



(c) 9y Managerial Practices, 4y All Mediators



(d) 9y Managerial Practices, 4y Soft Skills Mediators



Note: Business Earnings variables are expressed in 2021 PPP adjusted US dollars; Managerial practice index is an [Anderson \(2008\)](#) index and is expressed in standard deviations. Total (Δ), direct ($\delta(1)$), and indirect effects ($\theta(1)$) are based on DML causal mediation (K-fold=5, Splits = 100) as in [Farbmacher et al. \(2022\)](#) and plotted for the pooled treatment group. Mediators measured at 4-year follow-up; outcomes at 9-year follow-up. Point estimates and standard errors are calculated with the median method across splits as in [Chernozhukov et al. \(2018\)](#). Vertical bars correspond to two-sided 95% confidence intervals.

Table 12: Labor Market, Wage, and Total Earnings (Monthly)

(a) Economic Participation: Employment Status and Wage Earnings, 4y Follow-up						
		(1)	(2)	(3)	(4)	(5)
		Economically Active	Wage Worker	Wage worker and Self-employed	Wage Earnings	Total Earnings
Hard skills	β	0.049**	0.031	0.024**	10.993	23.278
	se	[0.019]	[0.020]	[0.011]	[8.242]	[29.806]
	<i>p</i> -value	0.011	0.133	0.030	0.182	0.217
Soft skills	β	0.038**	0.004	0.025**	-6.414	-14.428
	se	[0.019]	[0.020]	[0.011]	[7.863]	[29.358]
	<i>p</i> -value	0.048	0.851	0.028	0.415	0.688
Pooled	β	0.043**	0.017	0.024**	2.356	3.963
	se	[0.017]	[0.018]	[0.010]	[7.124]	[26.404]
	<i>p</i> -value	0.012	0.341	0.013	0.741	0.440
Mean control group		0.639	0.432	0.069	108.585	482.135
<i>p</i> -value Hard skills = Soft skills		0.702	0.353	0.967	0.1265	0.367
Observations		3,890	3,890	3,890	3,890	3,890

(b) Economic Participation: Employment Status and Wage Earnings, 9y Follow-up						
		(1)	(2)	(3)	(4)	(5)
		Economically Active	Wage Worker	Wage worker and Self-employed	Wage Earnings	Total Earnings
Hard skills	β	0.003	0.002	0.018	42.964	120.811**
	se	[0.013]	[0.022]	[0.019]	[33.074]	[59.879]
	<i>p</i> -value	0.839	0.938	0.343	0.194	0.022
Soft skills	β	-0.008	0.012	0.018	27.013	112.081**
	se	[0.013]	[0.022]	[0.019]	[32.764]	[61.289]
	<i>p</i> -value	0.536	0.591	0.330	0.410	0.034
Pooled	β	-0.002	0.008	0.018	35.471	116.369**
	se	[0.012]	[0.020]	[0.016]	[29.060]	[53.550]
	<i>p</i> -value	0.832	0.693	0.264	0.222	0.015
Mean control group		0.904	0.556	0.235	456.258	919.366
<i>p</i> -value Hard skills = Soft skills		0.559	0.744	0.984	0.732	0.919
Observations		3,396	3,396	3,396	3,396	3,396

Note: Results in columns (1)–(5) are based on DML (K-fold=5, Splits=100); point estimates and standard errors are calculated with the median method across splits as in [Chernozhukov et al. \(2018\)](#). *p*-values are one-sided for column (5), but are two-sided for columns (1)–(4), given the theoretical ambiguity of the direction of wage sector effects. All variables are in levels. The outcome in column (4) is not conditional on employment status and is defined as the joint outcome of working for someone else and wage earnings. Wage earnings and total earnings are expressed in 2021 PPP adjusted US dollars.

A.4 Tables: Return on Investment

Table 13: SEED Present Discounted Value (PDV) and Return on Investment, Pooled Sample

from 4y to 15y	Business Earnings		Total Earnings		Program Cost
	PDV	PDV/Cost	PDV	PDV/Cost	Per Youth
Offering SEED (ITT)	2,892.64	20.17x	3,882.56	27.07x	143.13
Taking-up SEED (LATE)	4,048.38	19.33x	5,663.55	27.05x	209.39

Note: Returns over years 1–3 are assumed to be zero, with differences emerging after year four; effect sizes between years four and nine grow at a constant annual rate; returns from years nine to 15 are assumed to be constant, and zero after year 15. The discount rate is set equal to 10%, in line with the median interest rate in Uganda during the 2013–2021 period. SEED costs per participant assigned to SEED are \$143.13. The cost per participant who took up SEED is \$209.39. All monetary values are expressed in 2021 PPP adjusted US dollars.

Table 14: Business and Total Earnings, Pooled Treatment: Summary

	Semi-Elasticity	E(Control) Monthly	Effect Size Monthly	Effect Size Yearly	Annualized Growth Rate
Panel A: ITT					
Business Earnings – 4y	0.069	145.959	10.085	121.020	
Business Earnings – 9y	0.160	472.003	75.401	904.808	49.53%
Total Earnings – 4y	0.008	482.135	3.963	47.556	
Total Earnings – 9y	0.127	919.366	116.369	1,396.427	96.59%
Panel B: LATE					
Business Earnings – 4y	0.101	145.959	14.756	177.076	
Business Earnings – 9y	0.222	472.003	104.756	1,257.074	47.99%
Total Earnings – 4y	0.019	482.135	9.291	111.493	
Total Earnings – 9y	0.177	919.366	162.704	1,952.451	77.28%

Note: The table summarizes the medium and long run earnings results under both ITT and LATE specifications. All values are expressed in 2021 PPP adjusted US dollars. Semi-elasticities are based on DML estimation in levels (see Tables 11 and 12). Annualized growth rates are computed for yearly effect sizes. Annualized growth rates for the mean of the control are 26.46% and 13.78% for business and total earnings, respectively, as in Table A.16.

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A Online Appendix

A.1 Balance and Attrition 4y and 9y Follow-ups

Table A.1: Balance Table at Baseline: Baseline Sample

	Control (n=1,198)	Hard Skills (n=1,613)	Soft Skills (n=1,591)	<i>p</i> -values		
	Mean	Mean	Mean	Hard vs Control	Soft vs Control	Hard vs Soft
Demographics and Expectations						
Age at baseline	20.04	20	20	0.423	0.429	0.994
Female	0.34	0.36	0.36	0.204	0.219	0.968
Boarding student	0.74	0.73	0.73	0.69	0.619	0.914
Business work experience index (Anderson)	0.02	-0.01	-0.01	0.107	0.184	0.761
Future subjective personal wealth (z-score)	-0.02	0.02	0.00	0.304	0.524	0.676
Plans to attend university (indicator)	0.71	0.7	0.71	0.498	0.885	0.566
Family background						
Parental SES index (Anderson)	0.00	-0.01	0.00	0.675	0.994	0.646
Housing index (Anderson)	-0.01	0.01	0.00	0.51	0.683	0.787
Subjective family wealth (z-score)	-0.02	0.00	0.01	0.592	0.379	0.709
Big Five Inventory (z-score)						
Extroversion	2.73	2.75	2.7	0.545	0.405	0.12
Openness	4.15	4.13	4.13	0.494	0.361	0.801
Emotional stability	3.86	3.88	3.85	0.473	0.891	0.356
Agreeableness	3.63	3.63	3.61	0.908	0.588	0.477
Conscientiousness	3.88	3.9	3.88	0.612	0.892	0.488
Skills (z-score)						
Memory (# digits recited backwards)	0.04	-0.01	-0.02	0.152	0.138	0.953
Intelligence (# Raven's matrices correct)	-0.01	0.02	-0.01	0.326	0.841	0.399
UACE O-levels score	-0.04	0.03	0.00	0.061	0.223	0.479
Math and business knowledge index	0.01	0.01	-0.02	0.99	0.339	0.307
Leadership index	-0.03	0.00	0.04	0.345	0.071	0.349
Perceived control index	0.00	0.01	0.01	0.938	0.789	0.836
Self-confidence index	0.05	-0.04	0.01	0.016	0.249	0.176
Prosocial index	-0.05	0.00	0.05	0.169	0.013	0.226
Patience index	-0.02	0.02	0.01	0.277	0.385	0.815
Willingness to take risks	0.00	0.00	0.00	0.959	0.914	0.864
Teacher and peer acceptance index	-0.03	0.01	0.03	0.248	0.111	0.633
Anxiety and depression index	-0.05	0.00	0.04	0.166	0.017	0.279
Travel time (hours)						
School to hard skills host school	1.49	1.51	1.50	0.583	0.791	0.759
School to hard skills meeting point	1.31	1.33	1.32	0.502	0.667	0.795
School to soft skills host school	1.21	1.24	1.23	0.434	0.603	0.779
School to soft skills meeting point	1.14	1.17	1.16	0.503	0.661	0.804
F-test of joint significance (F-stat)				1.27	1.20	0.59
<i>p</i> -value				0.167	0.221	0.951

Table A.2: Balance Table at Baseline: Take-up Sample and Control Group

	Control (n=1,198)	Hard skills (n=1,089)	Soft skills (n=1,105)	<i>p</i> -values		
	Mean	Mean	Mean	Hard vs Control	Soft vs Control	Hard vs Soft
Demographics and Expectations						
Age at baseline	20.04	20.07	20.06	0.692	0.77	0.917
Female	0.34	0.32	0.33	0.446	0.588	0.827
Boarding student	0.74	0.70	0.71	0.035	0.139	0.532
Business work experience index (Anderson)	0.02	-0.01	0.00	0.159	0.358	0.629
Future subjective personal wealth (z-score)	-0.02	-0.01	0.00	0.669	0.561	0.882
Plans to attend university (indicator)	0.71	0.66	0.71	0.016	0.806	0.034
Family background						
Parental SES index (Anderson)	0.00	-0.02	-0.02	0.352	0.336	0.978
Housing index (Anderson)	-0.01	-0.06	-0.05	0.158	0.26	0.776
Subjective family wealth (z-score)	-0.02	-0.04	-0.04	0.636	0.685	0.947
Big 5 (z-score)						
Extroversion	2.73	2.76	2.72	0.382	0.822	0.282
Openness	4.15	4.11	4.14	0.228	0.751	0.383
Emotional stability	3.86	3.87	3.86	0.694	0.881	0.811
Agreeableness	3.63	3.6	3.59	0.303	0.245	0.901
Conscientiousness	3.88	3.87	3.88	0.634	0.771	0.855
Skills (z-score)						
Memory (# digits recited backwards)	0.04	-0.06	-0.06	0.014	0.017	0.934
Intelligence (# Raven's matrices correct)	-0.01	0.02	-0.02	0.368	0.973	0.36
UACE O-levels score	-0.04	0.05	0.02	0.03	0.129	0.516
Math and business knowledge index	0.01	0.01	-0.02	0.887	0.354	0.444
Leadership index	-0.03	0.02	0.03	0.225	0.149	0.826
Perceived control index	0.00	0.01	0.01	0.872	0.929	0.944
Self-confidence index	0.05	-0.03	0.02	0.041	0.39	0.244
Prosocial index	-0.05	0.00	0.05	0.296	0.022	0.225
Patience index	-0.02	0.04	0.02	0.16	0.339	0.657
Willingness to take risks	0.00	0.00	0.02	0.92	0.616	0.556
Teacher and peer acceptance index	-0.03	0.02	0.02	0.164	0.205	0.901
Anxiety and depression index	-1.17	-1.19	-1.18	0.041	0.39	0.244
F-test of joint significance (F-stat)				1.73	1.18	1.22
<i>p</i> -value				0.013	0.247	0.200

Table A.3: Attrition, 4-Year Follow-up

	(1)		(2)	
	β	se	β	se
Hard Skills Treatment	-0.044***	(0.013)	-0.044***	(0.013)
Soft Skills Treatment	-0.040***	(0.013)	-0.038***	(0.013)
Demographics and Expectations				
Age (years)			0.009**	(0.004)
Female			0.025**	(0.011)
Boarding student			-0.016	(0.013)
Business work experience index (Anderson)			-0.005	(0.011)
Future subjective personal wealth (z-score)			-0.010*	(0.005)
Plans to attend university (indicator)			-0.028**	(0.012)
Family Background				
Parental SES index (Anderson)			0.020**	(0.010)
Housing index (Anderson)			-0.021***	(0.007)
Subjective family wealth (z-score)			0.001	(0.006)
Big 5 (z-score)				
Extraversion			-0.010*	(0.005)
Openness			-0.010	(0.007)
Emotional stability			0.005	(0.007)
Agreeableness			0.008	(0.008)
Conscientiousness			0.006	(0.008)
Skills (z-score)				
Memory (# digits recited backwards)			-0.011**	(0.005)
Intelligence (# Raven's matrices correct)			-0.002	(0.005)
UACE O-levels score			0.003	(0.006)
Math and business knowledge index			-0.007	(0.005)
Leadership index			-0.010	(0.006)
Perceived control index			0.000	(0.005)
Self-confidence index			-0.002	(0.006)
Prosocial index			-0.004	(0.006)
Patience index			0.005	(0.005)
Willingness to take risks			0.002	(0.005)
Teacher and peer acceptance index			-0.003	(0.006)
Anxiety and depression index			-0.007	(0.006)
Travel time				
School to hard skills host school			0.024**	(0.012)
School to hard skills meeting point			0.009	(0.014)
School to soft skills host school			-0.003	(0.020)
School to soft skills meeting point			-0.009	(0.023)
Observations	4,402		4,402	

Note: The dependent variable equals one if the respondent is not observed in the 4-year follow-up. Column (2) adds baseline covariates. Robust standard errors in parentheses. *, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

Table A.4: Balance Table: Estimation Sample, 4-Year Follow-up

	Control (n=1,022)	Hard skills (n=1,447)	Soft skills (n=1,421)	<i>p</i> -values		
	Mean	Mean	Mean	Soft vs Hard	Soft vs Control	Hard vs Control
Demographics and Expectations						
Age at baseline	20.00	19.98	20.00	0.735	0.981	0.692
Female	0.32	0.36	0.35	0.036	0.094	0.647
Boarding student (indicator)	0.75	0.73	0.74	0.390	0.483	0.865
Business work experience index (Anderson)	0.02	-0.01	0.00	0.229	0.311	0.839
Future subjective wealth (z-score)	0.01	0.03	0.01	0.548	0.998	0.509
Plans to attend university (indicator)	0.72	0.70	0.72	0.501	0.811	0.318
Family background						
Parental SES index (Anderson)	0.00	-0.01	0.00	0.730	0.749	0.466
Housing index (Anderson)	0.01	0.02	0.01	0.834	0.929	0.896
Subjective family wealth (z-score)	0.00	0.00	0.02	0.966	0.629	0.629
Big Five Inventory (z-score)						
Extroversion	2.74	2.76	2.71	0.750	0.358	0.174
Openness	4.15	4.15	4.14	0.843	0.547	0.657
Emotional stability	3.86	3.87	3.86	0.543	0.974	0.528
Agreeable	3.62	3.62	3.62	0.997	0.964	0.964
Conscientious	3.89	3.90	3.88	0.686	0.809	0.478
Skills (z-score)						
Memory (# digits recited backwards)	0.05	0.00	-0.02	0.183	0.085	0.663
Intelligence (# Raven's matrices correct)	-0.01	0.04	-0.01	0.298	0.925	0.214
UACE O-levels score	-0.07	0.02	-0.01	0.037	0.149	0.484
Math and business knowledge index	0.01	0.02	0.00	0.804	0.677	0.466
Leadership index	-0.01	0.02	0.05	0.497	0.119	0.334
Perceived control index	0.00	0.00	0.02	0.874	0.669	0.520
Self-confidence index	0.07	-0.02	0.01	0.013	0.098	0.371
Prosocial index	-0.03	0.02	0.05	0.285	0.046	0.308
Patience index	-0.03	0.01	0.01	0.282	0.359	0.866
Willingness to take risks	-0.01	0.01	0.01	0.510	0.584	0.905
Teacher and peer acceptance index	0.00	0.02	0.03	0.639	0.449	0.750
Anxiety and depression index	-0.05	0.00	0.04	0.232	0.046	0.378
Travel time (hours)						
School to hard skills host school	1.43	1.47	1.46	0.304	0.440	0.782
School to hard skills meeting point	1.25	1.30	1.30	0.222	0.263	0.915
School to soft skills host school	1.18	1.22	1.24	0.354	0.192	0.677
School to soft skills meeting point	1.11	1.15	1.17	0.359	0.185	0.650
F-test of joint significance (F-stat)				1.07	1.01	0.46
<i>p</i> -value				0.368	0.444	0.995

Table A.5: Program Take-Up by Assignment Status and Follow-Up Round**(a)** Baseline Sample ($N = 4,402$)

	No Take-Up	Take-Up	Total
Control	1,198	0	1,198
Hard Skills	523	1,090	1,613
Soft Skills	486	1,105	1,591
Total	2,207	2,195	4,402

(b) 4-Year Follow-Up Sample ($N = 3,890$)

	No Take-Up	Take-Up	Total
Control	1,022	0	1,022
Hard Skills	444	1,003	1,447
Soft Skills	409	1,012	1,421
Total	1,876	2,014	3,890

(c) 9-Year Follow-Up Sample ($N = 3,396$)

	No Take-Up	Take-Up	Total
Control	872	0	872
Hard Skills	372	914	1,286
Soft Skills	334	903	1,238
Total	1,581	1,815	3,396

Note: Table reports realized program take-up (any attendance) for the experimental groups. No control group participants attended the program, implying no defiers, and supporting the monotonicity assumption underlying LATE estimation.

Table A.6: Program Take-up Rates, 4-Year Follow-Up Sample

	(1)		(2)	
	Hard skills		Soft skills	
	β	se	β	se
Demographics, Experience, Expectations				
Age at baseline	0.003	(0.009)	0.003	(0.010)
Female	-0.079***	(0.029)	-0.077***	(0.028)
Boarding student	-0.107***	(0.027)	-0.038	(0.028)
Business work experience index (Anderson)	-0.020	(0.028)	0.008	(0.029)
Future subjective personal wealth (z-score)	-0.004	(0.013)	0.014	(0.013)
Plans to attend university (indicator)	-0.092***	(0.026)	0.013	(0.028)
Family background				
Parental SES index (Anderson)	0.038	(0.025)	-0.018	(0.025)
Housing index (Anderson)	-0.063***	(0.016)	-0.027	(0.017)
Subjective family wealth (z-score)	-0.003	(0.013)	-0.028**	(0.014)
Big Five Inventory (z-score)				
Extroversion	0.013	(0.014)	0.015	(0.014)
Openness	-0.026	(0.018)	0.025	(0.017)
Emotional stability	-0.003	(0.019)	0.008	(0.018)
Agreeableness	-0.031	(0.019)	-0.012	(0.019)
Conscientiousness	-0.039**	(0.019)	-0.010	(0.019)
Skills (z-score)				
Memory (# digits recited backwards)	-0.038***	(0.013)	-0.036***	(0.013)
Intelligence (# Raven's matrices correct)	0.016	(0.013)	-0.005	(0.013)
UACE O-levels score	0.007	(0.013)	0.011	(0.013)
Math and business knowledge index	0.004	(0.012)	-0.002	(0.012)
Leadership index	0.026*	(0.014)	-0.012	(0.014)
Perceived control index	-0.000	(0.013)	-0.006	(0.012)
Self-confidence index	0.017	(0.013)	0.006	(0.014)
Prosocial index	0.001	(0.014)	0.009	(0.015)
Patience index	0.002	(0.013)	0.005	(0.013)
Willingness to take risks	0.008	(0.012)	0.011	(0.013)
Teacher and peer acceptance index	0.010	(0.014)	-0.011	(0.014)
Anxiety and depression index	0.015	(0.014)	-0.011	(0.013)
Constant	1.122***	(0.236)	0.561**	(0.240)
Treatment group take-up rate	0.678		0.698	
Observations	1,613		1,591	
R-squared	0.096		0.069	

Note: The dependent variable equals one if youth attended SEED. Standard errors in parentheses. *, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

Table A.7: Balance Table: Estimation Sample, 9y Follow-up

	Control (n=872)	Hard Skills (n=1286)	Soft Skills (n=1238)	<i>p</i> -values		
	Mean	Mean	Mean	Hard vs Control	Soft vs Control	Hard vs Soft
Demographics and Expectations						
Age (years)	20.04	20.01	19.99	0.535	0.718	0.777
Female	0.32	0.34	0.36	0.100	0.346	0.443
Boarding student	0.76	0.73	0.75	0.564	0.159	0.354
Business work experience index (Anderson)	0.02	0.00	0.01	0.228	0.495	0.569
Future subjective personal wealth (z-score)	-0.02	0.00	0.02	0.446	0.796	0.581
Plans to attend university (indicator)	0.72	0.72	0.71	0.476	0.867	0.332
Family Background						
Parental SES index (Anderson)	0.00	0.02	-0.02	0.331	0.600	0.098
Housing index (Anderson)	0.00	0.00	-0.01	0.778	0.997	0.759
Subjective family wealth (z-score)	-0.02	0.00	-0.02	0.920	0.556	0.587
Big Five Inventory (z-score)						
Extroversion	0.02	-0.01	0.02	0.963	0.481	0.464
Openness	0.01	-0.02	0.00	0.927	0.628	0.662
Emotional stability	0.02	-0.03	0.03	0.202	0.831	0.101
Agreeableness	-0.02	-0.03	-0.01	0.807	0.720	0.504
Conscientiousness	-0.01	-0.01	0.02	0.492	0.967	0.477
Skills (z-score)						
Memory (# digits recited backwards)	0.05	0.00	0.00	0.254	0.249	0.982
Intelligence (# Raven's matrices correct)	0.00	-0.01	0.03	0.519	0.854	0.361
UACE O-levels score	-0.07	-0.01	0.00	0.095	0.156	0.789
Math and business knowledge index	-0.01	0.00	0.02	0.509	0.854	0.601
Leadership index	-0.04	0.03	0.02	0.217	0.138	0.774
Perceived control index	0.01	0.02	0.00	0.861	0.863	0.701
Self-confidence index	0.08	0.00	-0.02	0.019	0.084	0.508
Prosocial index	-0.06	0.04	0.01	0.114	0.030	0.506
Patience index	-0.03	0.01	0.01	0.379	0.368	0.976
Willingness to take risks	0.02	0.00	0.02	0.977	0.719	0.713
Teacher and peer acceptance index	-0.02	0.02	0.02	0.415	0.458	0.940
Anxiety and depression index	-0.06	0.04	0.00	0.124	0.022	0.396
Travel Time						
School to hard skills host school	1.42	1.46	1.47	0.277	0.406	0.784
School to hard skills meeting point	1.23	1.29	1.30	0.097	0.178	0.740
School to soft skills host school	1.16	1.24	1.22	0.196	0.125	0.779
School to soft skills meeting point	1.10	1.17	1.16	0.148	0.120	0.895
F-test of joint significance (F-stat)				0.733	0.565	1.296
<i>p</i> -value				0.853	0.973	0.130

Table A.8: Attrition, 9-Year Follow-up

	(1)		(2)	
	β	se	β	se
Hard Skills Treatment	-0.069***	(0.016)	-0.075***	(0.016)
Soft Skills Treatment	-0.050***	(0.017)	-0.055***	(0.016)
Demographics and Expectations				
Age (years)			0.003	(0.005)
Female			0.043***	(0.015)
Boarding student			-0.032**	(0.016)
Business work experience index (Anderson)			-0.004	(0.012)
Future subjective personal wealth (z-score)			-0.001	(0.007)
Plans to attend university (indicator)			-0.038**	(0.015)
Family Background				
Parental SES index (Anderson)			-0.003	(0.013)
Housing index (Anderson)			0.006	(0.009)
Subjective family wealth (z-score)			0.011	(0.007)
Big Five Inventory (z-score)				
Extraversion			-0.002	(0.007)
Openness			0.007	(0.007)
Emotional stability			0.008	(0.007)
Agreeableness			0.011	(0.007)
Conscientiousness			-0.002	(0.007)
Skills (z-score)				
Memory (# digits recited backwards)			-0.012**	(0.006)
Intelligence (# Raven's matrices correct)			0.000	(0.007)
UACE O-levels score			0.008	(0.007)
Math and business knowledge index			0.000	(0.007)
Leadership index			0.004	(0.008)
Perceived control index			0.000	(0.007)
Self-confidence index			-0.012	(0.008)
Prosocial index			0.003	(0.008)
Patience index			0.002	(0.007)
Willingness to take risks			-0.008	(0.007)
Teacher and peer acceptance index			-0.003	(0.008)
Anxiety and depression index			0.006	(0.007)
Travel time				
School to hard skills host school			0.013	(0.017)
School to hard skills meeting point			0.026	(0.020)
School to soft skills host school			0.019	(0.026)
School to soft skills meeting point			-0.037	(0.031)
Observations	4,402		4,402	

Note: The dependent variable equals one if the respondent is not observed in the 9-year follow-up. Column (2) adds baseline covariates. Robust standard errors in parentheses. *, **, *** denote significance at the 10, 5, and 1 percent levels, respectively.

A.2 Additional Results

Figure A.1: Timeline, Study and Data Collection Milestones

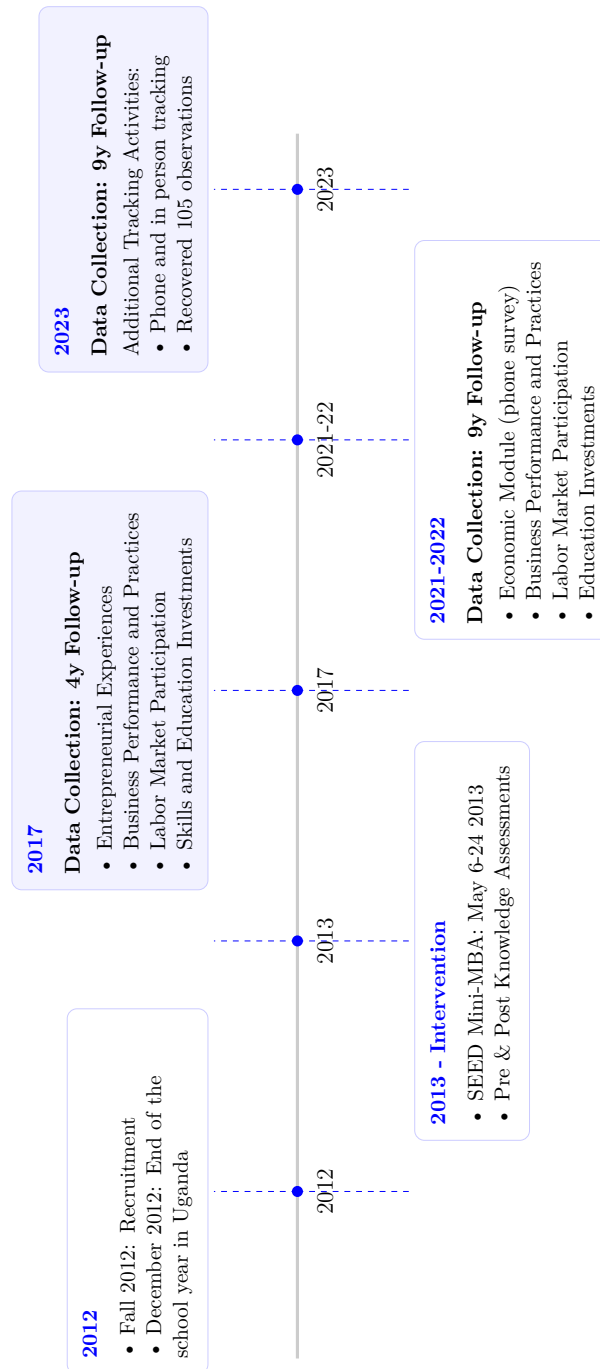


Table A.10: Business Sector, an Overview

(a) Business Sector, 4y Follow-up

Active Business, Sector Distribution (%)	Full Sample	Control	Hard Skills	Soft Skills
Retail and Food Services	52.9	54.8	51.6	53.1
Food Production	27.5	27.9	28.3	26.4
General Services	6.8	5.2	6.8	7.7
Skilled Services	5.3	3.9	4.9	6.5
Manufacturing, Construction, Repair	5.4	6.6	6.1	4.0
Other	2.2	1.6	2.3	2.3
Number of Businesses	1,339	305	512	522

(b) Business Sectors, 9y Follow-up

Active Business, Sector Distribution (%)	Full Sample	Control	Hard Skills	Soft Skills
Retail and Food Services	44.49	42.58	44.44	45.82
Food Production	34.42	34.03	35.83	33.22
General Services	7.19	8.87	6.33	6.95
Skilled Services	9.23	8.87	9.14	9.55
Manufacturing, Construction, Repair	3.71	4.52	3.53	3.37
Other	0.96	1.13	0.73	1.09
Number of Businesses	2,504	620	963	921

Table A.9: Big Five, Individual Dimensions, 4y Follow-up

		(1)	(2)	(3)	(4)	(5)
		Agreeable	Conscientious	Extrovert	Emotional Stability	Openness
Hard skills	β	0.088**	0.120***	0.129***	0.119***	0.114***
	se	[0.039]	[0.040]	[0.040]	[0.040]	[0.039]
	<i>p</i> -value	0.012	0.001	0.001	0.001	0.002
Soft skills	β	0.067**	0.057*	0.147***	0.045	0.138***
	se	[0.039]	[0.040]	[0.040]	[0.040]	[0.039]
	<i>p</i> -value	0.043	0.078	0.000	0.130	0.000
Mean control group		0.000	0.000	0.000	0.000	0.000
<i>p</i> -value Hard skills = Soft skills		0.706	0.265	0.745	0.194	0.666
Observations		3,890	3,890	3,890	3,890	3,890

Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors across splits are calculated with the median method as in Chernozhukov et al. (2018).

Table A.11: Labor: Employees at 9y Follow-up

		(1)	(2)	(3)	(4)
		Have Paid Employees	Have Unpaid Employees	Have Paid + Unpaid Employees	Number of Paid + Unpaid Employees
Hard skills	β	0.040**	0.013	0.030*	0.021
	se	0.021	0.016	0.021	0.213
	<i>p</i> -value	0.028	0.208	0.076	0.460
Soft skills	β	0.024	0.013	0.020	0.028
	se	0.021	0.016	0.021	0.218
	<i>p</i> -value	0.122	0.206	0.178	0.449
Pooled	β	0.031**	0.012	0.024	0.017
	se	0.018	0.014	0.019	0.200
	<i>p</i> -value	0.045	0.186	0.103	0.466
Mean control group		0.333	0.142	0.406	1.731
<i>p</i> -value Hard skills = Soft skills		0.599	0.991	0.724	0.983
Observations		3,396	3,396	3,396	3,396

Note: Results are based on DML (K-fold=5, Splits=100); point estimates and standard errors are calculated with the median method across splits as in Chernozhukov et al. (2018). *p*-values are one-sided. The dependent variables in columns (1)–(3) are dichotomous. Outcomes are not conditional on employment status; they are defined as the joint outcome of owning a business and the relevant outcome variable.

Table A.12: Imai et al. (2010) Mediation Sensitivity Analysis, 9y Outcomes**(a) Panel A: Outcome, Business Earnings 9y**

Mediator, 4y	R_Y^2	R_M^2	Sensitivity, Indirect Effects Treatment			Sensitivity, Indirect Effects Control		
			Residual	Residual	Residual	Residual	Residual	Residual
			Variance Scale (ρ)	Variance Outcome Y	Variance Mediator M	Variance Scale (ρ)	Variance Outcome Y	Variance Mediator M
Business Experience***	0.075	0.138	0.12	11.1%	10.3%	0.04	3.7%	3.4%
Business Practices**	0.072	0.086	0.08	7.4%	7.3%	0.10	9.3%	9.1%
Extroversion***	0.072	0.142	0.06	5.6%	5.1%	0.00	0.0%	0.0%
Openness**	0.064	0.082	0.04	3.7%	3.7%	0.00	0.0%	0.0%
Plasticity**	0.064	0.082	0.04	3.7%	3.7%	0.00	0.0%	0.0%

(b) Panel B: Outcome, Business Practices 9y

Mediator, 4y	R_Y^2	R_M^2	Sensitivity, Indirect Effects Treatment			Sensitivity, Indirect Effects Control		
			Residual	Residual	Residual	Residual	Residual	Residual
			Variance Scale (ρ)	Variance Outcome Y	Variance Mediator M	Variance Scale (ρ)	Variance Outcome Y	Variance Mediator M
Business Practices***	0.115	0.088	0.12	10.6%	10.9%	0.12	10.6%	10.9%
Business Experience*	0.107	0.145	0.04	3.6%	3.4%	0.08	7.1%	6.8%
Plasticity**	0.108	0.087	0.08	7.1%	7.3%	0.04	3.6%	3.7%
Openness**	0.108	0.087	0.08	7.1%	7.3%	0.04	3.6%	3.6%
Extroversion***	0.110	0.145	0.06	5.3%	5.1%	0.06	5.3%	5.1%

Note: The table focuses only on the mechanisms whose indirect effects were statistically significant in Figure 3. The asterisks next to the mediator name indicate the level of significance of its indirect effect. This table reports the proportion of residual variance in the mediator and outcome that an omitted confounder would need to explain, given the observed R^2 values and the residual correlation parameter ρ . The key sensitivity parameter, ρ , is defined as the correlation between the residuals of the mediator and outcome equations. Under sequential ignorability, ρ should equal zero. Sensitivity analysis evaluates how large ρ must be for the estimated indirect effect to disappear. Greater robustness corresponds to indirect effects that remain statistically significant even under relatively large departures from $\rho = 0$. To assess robustness, ρ is varied in increments of 0.02 over the range $[-0.9, 0.9]$. We report both the value of ρ and the proportion of unexplained variance in M and Y that a hypothetical omitted confounder would need to account for in order to eliminate the estimated mediation effect. Larger required residual variance shares indicate greater robustness. Shares are reported both on the residual-variance scale (equal split) and separately for the mediator and the outcome. The “equal split” assumption allocates the required residual variance symmetrically across the mediator and outcome models, i.e. assuming that the confounder explains the same proportion of unexplained variance in M and Y . Following Imai et al. (2010,?), the sensitivity analysis is based on varying ρ and evaluating the point at which the estimated indirect effect is reduced to zero. Reported quantities are averaged across 100 Monte Carlo simulations to approximate the sampling distribution of the sensitivity parameters. To approximate DML, we adapt LASSO double selection following Belloni et al. (2016). Specifically, we estimate the treatment equation ($T \sim X$), the outcome equation ($Y \sim X$), and the mediator equation ($M \sim T, X$), including quadratic and interaction terms of de-meaned covariates. Variable selection is performed using LASSO with 5-fold cross-validation, and the final control set is defined as the union of covariates selected across all three equations. These selected controls are then included in the mediation analysis for both the outcome equation ($Y \sim T, M, X$) and the mediator equation ($M \sim T, X$). Sensitivity analysis is conducted using robust standard errors.

A.3 Peer Effects

Consistent with traditional approaches, we model peer effect treatments as leave-one-out averages of peers' pre-treatment characteristics (see, for instance, [Carrell et al. \(2009\)](#); [Sacerdote \(2011\)](#); [Duflo et al. \(2011\)](#)). In particular, we consider whether peer business experience (proxied by business ownership prior to SEED) and peer performance on pre-knowledge tests for hard and soft skills have an impact on self-employment and business earnings 9-years post training. We also test whether exposure to peers who are more digitally connected impacts these same long term outcomes. Our study design (see Figure [A.1](#)) allows us to define and measure peer influence at the class or school levels. The peer effect estimating equation is given by:

$$ITT : Y_i = \beta \bar{D}_{-i,group,v1} + f(X_i, D_{i,group}) + \varepsilon_{i,group}, \quad \text{where } group = class, school \quad (3)$$

Where

- Y_i denotes the outcome y of youth i in a given class/site;
- $\bar{D}_{-i,group,v1}$ is the leave-one-out *assigned* classroom/school mean of peers' characteristics (constructed using assigned class-/school-mates);
- $D_{i,group}$ denotes individual i 's pre-training (baseline) characteristics.
- Whenever it is missing, the value of $D_{i,group}$ is imputed for youth who were assigned to treatment and took the knowledge test pre-training. Test scores were imputed with the mean pre-test score.
 - Pre-SEED knowledge tests are available only for youth who reported to training camps. Approximately 90% of youth who reported for SEED took the pre-test. Pre-training test scores were imputed for 38% of youth assigned to treatment.
 - Missing-value dummies are also included in the model.
 - Peer treatments as they relate to pre-test scores, $\bar{D}_{-i,group,v1}$ (i.e., the share of students scoring in the top 25% or 50% in a given class/school), were calculated based on the pre-imputation distribution of scores.
- X_i is a vector of baseline characteristics;
- $f(\cdot)$ is an unknown high-dimensional nuisance parameter.

We also compute LATE estimates for peer treatment effects to account for take-up decisions. That is,

- $\bar{D}_{-i,group,v2}$ is the *realized* measure of peer-exposure, which is instrumented with $\bar{D}_{-i,group,v1}$ in the first stage:

$$\bar{D}_{-i,group,v2} = \begin{cases} \frac{\sum_{j \neq i} D_{j,group} T_{j,group}}{\sum_{j \neq i} T_{j,group}} & \text{if } T_{i,group} = 1 \text{ and } \sum_{j \neq i} T_{j,group} > 0, \\ 0 & \text{if } T_{i,group} = 0 \text{ (non-complier)} \end{cases}$$

$T_{j,class} \in \{0, 1\}$ is an indicator of attendance (take-up). Non-attending peers are excluded from both the numerator and the denominator; a non-attending youth i is assigned zero exposure.

In Tables A.13, A.14, and A.15, we report *Double/Debiased Machine Learning (DML)* estimates (Chernozhukov et al., 2018). However, because the peer treatment is continuous, we must estimate a partial linear model instead of a fully interactive DML model as in the main specification (Bach et al., 2022; Chernozhukov et al., 2018). DML estimates rely on K-fold cross-fitting, with $K = 5$ and repetition $S = 100$. Sample medians of the estimates and median standard errors obtained from the empirical distribution across the S replications/splits are reported. Standard errors are clustered at either the class or training site level to match the peer treatment definition. The DML clustered standard errors are implemented as in Chiang et al. (2022).

Table A.13: Effects of Peers' Experience at Baseline on Long Term Outcomes (9y), ITT

Treatment:	Full Sample				No Business at Baseline			
	% Classmates Owning Business		% Schoolmates Owning Business		% Classmates Owning Business		% Schoolmates Owning Business	
	Business	Active	Business	Active	Business	Active	Business	Active
	Earnings	Business	Earnings	Business	Earnings	Business	Earnings	Business
β	-227.410	0.074	182.814	0.196	-53.095	0.291**	-45.253	0.348
se	236.413	0.106	292.373	0.152	374.325	0.142	441.952	0.323
p -values	0.336	0.486	0.532	0.197	0.887	0.041	0.918	0.282
mean dep. var	543.456	0.589	543.456	0.589	455.408	0.542	455.408	0.542
mean(Treatment)	0.431	0.431	0.431	0.431	0.427	0.427	0.426	0.426
sd(Treatment)	0.095	0.095	0.066	0.066	0.098	0.098	0.067	0.067
Observations	2,524	2,524	2,524	2,524	1,427	1,427	1,427	1,427

Note: Estimates are from DML partial linear models (Chernozhukov et al., 2018; Bach et al., 2022), with 5-fold cross-fitting and 100 repetitions ($K = 5$, $S = 100$). Coefficients and standard errors are sample medians across replications. We report two-sided p -values given the theoretical ambiguity of the direction of peer effects. Standard errors clustered at class or training-site level (Chiang et al., 2022). Peer treatment corresponds to the leave-one-out share of peers at the class (columns 1, 2 and 5, 6) or site level (columns 3,4 and 7,8) who owned a business at baseline.

Table A.14: Effects of Peers' Quality/Knowledge on Long Term Outcomes (9y), ITT**(a)** Peers in Top 25% of Knowledge Distribution

Treatment:	Hard Skills				Soft Skills			
	% Classmates in top 25%		% Schoolmates in top 25%		% Classmates in top 25%		% Schoolmates in top 25%	
	Business Earnings	Active Business	Business Earnings	Active Business	Business Earnings	Active Business	Business Earnings	Active Business
β	-225.706	-0.014	-27.098	-0.083	-142.552	-0.018	-209.747	-0.043
se	207.423	0.100	273.483	0.137	266.007	0.115	353.549	0.123
p -values	0.277	0.889	0.921	0.546	0.592	0.874	0.553	0.728
mean dep. var	543.456	0.589	543.456	0.589	543.456	0.589	543.456	0.589
mean(Treatment)	0.158	0.158	0.157	0.157	0.157	0.157	0.157	0.157
sd(Treatment)	0.100	0.100	0.081	0.081	0.086	0.086	0.065	0.065
Observations	2,524	2,524	2,524	2,524	2,524	2,524	2,524	2,524

(b) Peers in Top 50% of Knowledge Distribution

Treatment:	Hard Skills				Soft Skills			
	% Classmates in top 50%		% Schoolmates in top 50%		% Classmates in top 50%		% Schoolmates in top 50%	
	Business Earnings	Active Business	Business Earnings	Active Business	Business Earnings	Active Business	Business Earnings	Active Business
β	-188.582	-0.018	-195.941	-0.071	-244.781	-0.070	-199.927	-0.076
se	203.783	0.086	237.352	0.091	194.740	0.090	322.808	0.092
p -values	0.355	0.836	0.409	0.435	0.209	0.436	0.536	0.409
mean dep. var	543.456	0.589	543.456	0.589	543.456	0.589	543.456	0.589
mean(Treatment)	0.314	0.314	0.315	0.315	0.313	0.313	0.314	0.314
sd(Treatment)	0.136	0.136	0.119	0.119	0.114	0.114	0.088	0.088
Observations	2,524	2,524	2,524	2,524	2,524	2,524	2,524	2,524

Note: Estimates from DML partial linear models (Chernozhukov et al., 2018; Bach et al., 2022), with 5-fold cross-fitting and 100 repetitions ($K=5$, $S=100$). Coefficients and standard errors are sample medians across replications. We report two-sided p -values given the theoretical ambiguity of the direction of peer effects. Standard errors clustered at class or training-site level (Chiang et al., 2022) to match the peer treatment definition. Peers treatment correspond to the leave-one-out share of peers at the class (columns 1, 2, 5, 6) or site level (columns 3, 4, 7, 8) who scored in the top 25% (Panel A.14a) or in the top 50% (Panel A.14b) of the pre-training test scores distribution.

Table A.15: Effects of Peers' Access to Email/Facebook on Long Term Outcomes (9y), ITT

Treatment:	% Classmates with Facebook		% Schoolmates with Facebook		% Classmates with Facebook or Email		% Schoolmates with Facebook or Email	
	Business Earnings	Active Business	Business Earnings	Active Business	Business Earnings	Active Business	Business Earnings	Active Business
β	29.156	-0.184	-196.751	-0.176*	-34.829	-0.152	-142.288	-0.147
se	308.891	0.126	363.841	0.105	289.903	0.121	368.803	0.117
p -values	0.925	0.144	0.589	0.093	0.904	0.208	0.700	0.210
mean dep. var	543.456	0.589	543.456	0.589	543.456	0.589	543.456	0.589
mean(Treatment)	0.162	0.162	0.162	0.162	0.181	0.181	0.180	0.180
sd(Treatment)	0.080	0.080	0.063	0.063	0.083	0.083	0.066	0.066
Observations	2,524	2,524	2,524	2,524	2,524	2,524	2,524	2,524

Note: Estimates from DML partial linear models (Chernozhukov et al., 2018; Bach et al., 2022), with 5-fold cross-fitting and 100 repetitions ($K = 5$, $S = 100$). Coefficients and standard errors are sample medians across replications. We report two-sided p -values given the theoretical ambiguity of the direction of peer effects. Standard errors clustered at class or training-site level (Chiang et al., 2022) to match the peer treatment definition. Peer treatment corresponds to the leave-one-out share of peers at the class (columns 1, 2, 5, 6) or site level (columns 3, 4, 7, 8) reporting having Facebook account or having either Facebook or Email at baseline.

Table A.16: Annualized Growth Rates: from 4y to 9y Follow-up

Group	Business Earnings		Total Earnings	
	Effect Size	Total	Effect Size	Total
Control Group	–	26.46%	–	13.78%
Pooled (ITT)	49.53%	75.99%	96.59%	110.37%
Pooled (LATE)	47.99%	74.45%	77.28%	91.06%

Table A.17: Scenario 2: Present Discounted Value (PDV) and Return on Investment, Pooled Sample

from 9y to 15y	Business Earnings		Total Earnings		Program Cost
	PDV	PDV/Cost	PDV	PDV/Cost	Per Youth
Offering SEED (ITT)	2,054.96	14.33x	3,171.50	22.11x	143.13
Taking-up SEED (LATE)	2,855.01	13.63x	4,434.31	21.18x	209.39

Note: Returns over years 1–8 are assumed to be zero, emerge in year nine and assumed constant between years nine and 15, and are zero thereafter. The discount rate is 10%, in line with the median interest rate in Uganda during the 2013–2021 period. SEED costs per participant assigned to SEED are \$143.13. The cost per participant who enrolled in SEED is \$209.39 . All monetary values are expressed in 2021 PPP adjusted US dollars.

A.4 Appendix: Outcomes, Variable Definitions

Table A.18: Outcome Definitions: Hard and Soft Skills

Variable	Definition
Hard Skills Knowledge Index	Weighted average across five components, where the weights are defined by the Anderson (2008) method and the components are unweighted means: 1. Number of correctly identified sources for business ideas (k1) 2. Correctly identified effects of competition (k2) 3. Number of correctly identified budget elements (k3) 4. Correctly identifying utility of record keeping (k4) 5. Number of correctly identified elements of a profit and loss statement (k5) Each component is standardized with respect to the mean and standard deviation of the control group.
Persuasion	Unweighted average of coders ratings (scale 1-5). Variables are dichotomized as follows 1(avg rating > 4): 1. How convincing (coders' average) 2. Would like to hire (coders' average)
Negotiation	Negotiation case study by Bontempo and Iyengar (2008): 1. Buyer and seller agreed (= 1 if agreement) 2. Final agreement on financing (PPP adjusted USD) 3. Final agreement on start date (months)
Big Five Inventory	Simple mean of Likert scales (1-5) for extroversion (8 items), openness (10 items), agreeableness (9 items), conscientiousness (9 items), and emotional stability (8 items). Each sub-scale was standardized with respect to the mean and standard deviation of the control group. John et al. (1991).
Plasticity	Confirmatory factor analysis was conducted with extroversion and openness as inputs to a single latent plasticity trait. Scores for each of the inputs were computed by averaging item responses for extroversion (8 items) and openness (10 items). Each item used a 5-point Likert scale. The resulting plasticity scores are standardized using control group mean and standard deviation. De Young (2006).
Stability	Confirmatory factor analysis was conducted with emotional stability, agreeableness, and conscientiousness as inputs to a single latent stability trait. Scores for each of the inputs were computed by averaging item responses for emotional stability (8 items), agreeableness (9 items), and conscientiousness (9 items). Each item used a 5-point Likert scale. The resulting plasticity scores are standardized using control group mean and standard deviation. De Young (2006).

Table A.19: Soft Skills, Definitions (Continued)

Variable	Definition
Self-efficacy	Total scores are calculated by summing responses across six items, each rated on a 5-point Likert scale. Total scores are then converted to standardized scores (z-scores) using the control group mean and standard deviation as the reference distribution. Scheier et al. (1994) .
(Managing) Stress	Stress Appraisal Measure (SAM) scores are computed as the simple mean across all 14 items. Total scores are standardized with respect to the control group. Peacock and Wong (1990) .
Soft Skills Index	Aggregate Anderson (2008) index, whose components include plasticity, stability, self-efficacy (GSE), stress assessment measure (SAM) Peacock and Wong (1990) .

Table A.20: Economic Outcomes, Definitions

Variable	Definition
Economically Active	Indicator for whether current economic activities include working for someone else or being self-employed
Self-Employed	Indicator for whether current economic activities include being self-employed
Working for Someone Else	Indicator for whether current economic activities include working for someone else
Working and Self-Employed	Indicator for whether current economic activities include working for someone else <i>and</i> being self-employed
Number of Business Starts	Total number of businesses started between May 2013 and the date of the 4y follow-up survey
Entrepreneurial Experience (Months)	Total number of months during which the respondent operated an active business, from the end of the program (May 2013) to the date of 4y follow-up survey.
Active Business	Indicator for whether business was reported as <i>currently open</i> at the time of data collection, and meeting any the following criteria: 1. Positive revenues (for agricultural and non-agricultural businesses) 2. Zero revenues and positive expenses (for agricultural businesses) During the 9y phone-based survey, we asked information on only up to three economic activities. The number of activities was not constrained in the 4y survey. Further, in the 9y survey we included a set of leading questions establishing whether a business was currently active; business details were asked only for currently active businesses. 1. Seasonal businesses were deemed active if they had at least one active season
Formal Business	Indicator for whether an active business reported having ever paid taxes or registered with national or local regulatory authorities
Has Partners	Indicator for whether business owner reported having business partners
Has Employees & Number of Employees	The 4y survey did not distinguish between paid and unpaid employees. The 9y survey asked about both separately. 1. 4y: Indicator for whether business reported having any employees (not including the owner or partners) 2. 9y: Indicator for whether business reported having any employees, paid or unpaid (not including the owner or partners) - directly comparable to the variable for 4y. 3. 9y: Separate indicators for paid employees and unpaid employees (not including the owner or partners)

Table A.21: Business Financials, Definitions

Variable	Definition
Revenues	Survey questions regarding monthly revenues. 1. 4y: <i>I would like you to think about the sales of all products and services of your business in the past 4 weeks. What were the sales of all products and services from your business?</i> 2. 9y: we distinguished between seasonal and non-seasonal businesses: • Seasonal: <i>I would like you to think about the sales of all products and services in the last month. What were the sales of all products and services from your farm/business?</i> • Non-seasonal: <i>I would like you to think about the sales of all products and services of your farm/business in an average month during the last completed season. What were the sales of all products and services from your farm/business?</i> We inquired about both last month and usual revenues.
Capital	The question regarding capital differed slightly for the two survey waves. The 4y survey question included tools; the 9y survey question focused only on the resale value of machines, equipment, and land. 1. 4y: Total cash value of all the machines, equipment, land, and tools for the operation of the business; 2. 9y: Resale value of all the machines, equipment, and land for the operation of the business (tools were not included).
Return to Capital	Ratio of business earnings (profits) to capital
Profit Margin	Ratio of business earnings to revenues
Business Earnings (4y)	Total monthly business earnings. 4y: Business sales, costs, and profits were asked in reference to the <i>last month</i>. Calculated profits (business earnings) are computed as self-reported monthly revenue minus self-reported monthly expenses. The 4y survey did not distinguish between seasonal and non-seasonal activities. Manual adjustments were implemented as follows: 1. <i>Agricultural businesses</i> • Calculated profits = take home pay if revenue = 0 and expenses > 0 ($n = 33$) • Calculated profits set to zero if revenue = 0, expenses > 0, and take home pay = 0 ($n = 191$); seasonality seems to explain negative profits for farming activities; we assume a lower bound of zero profits 2. <i>Non-agricultural businesses</i> • Calculated profits = take home pay if revenue = 0 and expenses ≥ 0 ($n = 23$)

Table A.22: Business Financials, Definitions (Continued)

Variable	Definition
Business Earnings (9y)	Total monthly business earnings. The 9y survey distinguished between three types of businesses: non-seasonal (i.e., if, over the last 12 months, the business did not earn any revenues for some part of the year), seasonal non-crop businesses, and seasonal crop activities. Questions were asked as follows: 1. <i>Non-Seasonal</i>: monthly profits, revenues, and costs were asked in reference to the last month and usual/typical profits in an average month over the past 12 months. 2. <i>Seasonal Non-Crop</i>: monthly business financials were asked for the average month for each season (high/low seasons). 3. <i>Seasonal Crop</i>: seasonal business financials for a given season (total) were asked for each season over the past 12 months. Typical/usual monthly figures were used for non-seasonal businesses and seasonal non-crop business; typical monthly amounts for seasonal crop businesses were computed using the calculated profits for the whole season as follows: • If business active for ≤ 12 months, divide by number of active months; • If business active for > 12 months, assume seasons overlap, add across seasons and divide by 12 During regular data quality checks, we discovered enumerator errors in business classifications as well as some data issues. Manual edits/corrections were implemented as follows: 1. <i>Unrealized Sales</i>: Businesses reporting negative profits due to unrealized sales (e.g., livestock not ready to be sold, loss of inventories or livestock due to natural disasters, so that the event did not reflect typical businesses performance) at the time of the survey were treated as zero profits ($n = 66$); 2. <i>Inactive Businesses</i>: Businesses operating for six or fewer months in the year prior to the survey (e.g. due Covid shutdowns) were reclassified as inactive ($n = 10$); 3. <i>Young Businesses</i>: Businesses operating for less than 12 months. Negative profits are understood as having unrealized sales and profits are set to zero ($n = 36$); 4. <i>Inconsistency in Magnitudes of Sales and Costs Due to Extra Zeros or Missing Zeros</i>. Adjustments are made so that the corrected profits are lower bound of real profits ($n = 21$); 5. <i>Misclassification of Seasonal Business by Enumerators</i>: Farm businesses incorrectly surveyed with non-seasonal modules are understood as having unrealized sales. Their profits are coded as zero ($n = 34$); 6. <i>Discrepancy between Calculated and Positive Take-Home Pay</i>: Businesses with negative calculated profits where the owner reported positive take-home pay are considered an enumerator error. Profits are set equal to the take-home pay ($n = 2$); 7. Additional corrections were made relying on enumerator's comments in the survey to justify/correct their recorded survey answers ($n = 18$).

Table A.23: Business Practices, Definitions

Variable	Definition
Business Practice Index	Anderson (2008)-style index that combines yes/no answers to an array of questions to understand whether respondents adopted various business/managerial practices, which are organized as follows: 1. Competition 2. Managerial practices 3. Fintech digital payments (only in the 9y survey) 4. Technology adoption (only in the 9y survey) We provide details below about specific questions in each category.
Competition Index	Anderson (2008)-style index combining yes/no answers to whether respondents adopted any of the following practices: 1. Visit competitors 2. Negotiate lower prices for inputs/services with suppliers 3. Compare product/service quality and prices across suppliers 4. Conduct any advertising activities for their business
Management Index	Anderson (2008)-style index combining yes/no answers to whether respondents adopted any of the following practices: 1. 4y Survey (a) Manage inventory (b) Manage other people (c) Perform accounting activities (d) Keep business records 2. 9y Survey (a) Keep business records (payroll, expenses, purchases, loans, inventory) (b) Make financial decisions (c) Make hiring/firing decisions
Fintech Adoption (9y)	Anderson (2008)-style index combining yes/no answers to whether respondents adopted any of the following practices: 1. Use mobile phone in combination with any other technology or software 2. Use mobile money to receive payments or to pay employees, bills, loans, taxes 3. Rely on mobile money to handle the business' financial transactions
Technology Adoption (9y)	Anderson (2008)-style index combining yes/no answers to whether respondents adopted any of the following practices: 1. Use IT solutions to administer business' sales, accounting, HR 2. Keep digital financial records

Table A.24: Economic Outcomes: Wage and Total Earnings, Definitions

Variable	Definition
Wage Earnings	Total monthly wage earnings are given by the sum of monthly wage earnings across all employee jobs. Survey questions relating to wage earnings are as follows: 1. 4y: <i>How much did you take home per [hour, day, week, month]?</i> The amount was then converted to monthly; 2. 9y: Respondents were asked to provide average/typical weekly earnings.
Total Earnings	Total (monthly) earnings are given by the sum of monthly wages and business earnings across all active economic activities; they are equal to zero for economically inactive individuals.

Table A.25: Education, Definitions

Variable	Definition
Enrolled in Post-secondary (4y)	Indicator for whether the respondent was currently enrolled in post-secondary education (university or vocational) at the time of the 4y survey.
Any Post-secondary (9y)	Indicator for whether the respondent had any post-secondary education (university or vocational) at the time of the 9y survey.
Complete Post-secondary (9y)	Indicator for whether the respondent had completed any post-secondary education (university or vocational) at the time of the 9y survey.