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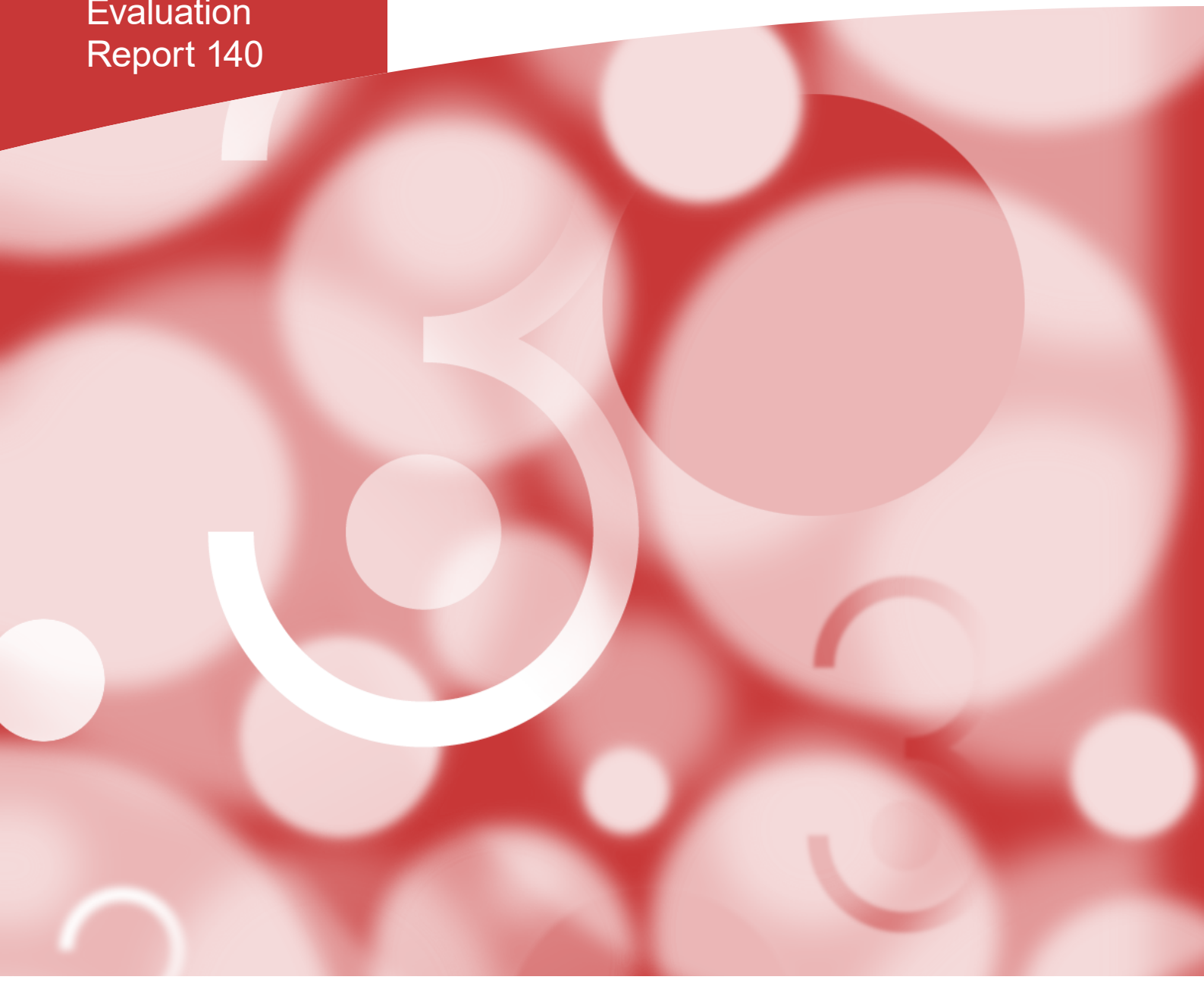
The effects of providing paid formal work and training on women's empowerment

Evidence from weavers' collectives in India

February 2025

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Social protection



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About this report

This report, The effects of providing paid formal work and training on women's empowerment: Evidence from weavers' collectives in India been submitted as part of the Swashakt: Empowering Women's Collectives Evidence Program funded by the Bill & Melinda Gates Foundation. This report has been copy-edited and formatted for publication by 3ie. The 3ie editorial production team for this report comprises Akarsh Gupta, Mallika Rao and Tanvi Lal.

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The effects of providing paid formal work and training on women's empowerment: Evidence from weavers' collectives in India

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The authors are solely responsible for all content, errors and omissions. Please direct all comments or queries to the corresponding author, Divya Pandey, at dpandey@3ieimpact.org.

Executive summary

Despite the well-established benefits of gender equality on economic growth and development, gender gaps persist across several indicators of human capital and economic attainment in nations across the globe, including India. According to the World Economic Forum's 2024 Gender Gap Index, India ranks 129th out of 146 countries, and UNDP's 2022 Gender Inequality Index places it in the lower half of 193 ranked countries.

Several government and practitioner-led programs attempt to enhance women's livelihoods and their economic and social empowerment, often by emphasizing women's collectives. Such collectives can enhance women's empowerment by serving as platforms for intervention delivery and facilitating information exchange and moral support through social networks (Díaz-Martin et al. 2023).

In 2020, 3ie launched the Swashakt Program to support interventions to identify what works to enhance the viability, scalability, and returns of women's collective enterprises, and to promote women's economic empowerment. Chitrika Foundation's **"Creating agency of women in weaving value-chain in India"** project is one such effort under Swashakt that aims to address key challenges faced by women weavers in southern India.

The Handloom Census (2019–2020) highlights the potential of the handloom sector to foster women's empowerment and financial independence. However, this sector is fraught with challenges, such as low economic returns, declining participation, and competition from cheap, mass-produced, power-loom textiles. In addition, weavers lack technical mentorship and institutional support, as they generally work independently.

Chitrika Foundation's intervention aims to address these challenges by collectivizing women weavers for training and supporting them across the value chain through handloom and artisan enterprises. Chitrika successfully incubated two collective enterprises in Andhra Pradesh and one in Telangana. During its project period (2021–2023), the Foundation's goal was to expand its membership by working with weaver communities in the two states and collectivizing them into either new or existing enterprises. In this paper, we present findings from the intervention's impact evaluation.

The evaluation uses individual- and household-level data collected between January–August 2024 through an endline survey of women weavers and their spouses, and quasi-experimental research methods. Using this methodology, we estimate the effects of training and paid employment (provided through women's collectives) on participants' socioeconomic empowerment outcomes. Our results showed no significant effect of the intervention on women's employment status, time spent on paid work, income and savings, or aspirations for their children.

However, we found that women participating in the intervention had higher loan amounts, greater self-efficacy, and more knowledge of digital payment methods than women who did not participate. Women exposed to the intervention were more likely to believe that women should work for pay outside the home, and also reported better mental health. Our conversations with the Chitrika team suggested that the lack of economic impact was due to a decline in wages and weaving time during the COVID-19 pandemic, which made other areas of employment more lucrative. Program implementers suggested that improvements in social empowerment outcomes can be attributed to the information exchange between women during training sessions.

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Abbreviations

IPWR	Inverse probability weighted regression
KII	Key informant interview
MBA	Master of business administration
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MIS	Management information system
OBC	Other backward classes
OLS	Ordinary least squares
PC	Producer company
RCT	Randomized controlled trial
SC	Scheduled caste
SHG	Self-help group
ST	Scheduled tribe

1. Introduction

Despite remarkable economic growth and advances in human capital across the globe over the past decade, gender gaps persist in labor force participation, earnings, access to credit, and education and health outcomes (Kucey et al. 2023). To empower women and girls, group-based models or collectives have garnered substantial interest from policymakers, practitioners, and researchers.

In their conceptual framework, Díaz-Martin et al. (2023) highlighted two potential benefits of women's groups. First, they serve as platforms for delivery, thereby allowing access to resources, information and training to a large number of participants in a given place and time. Second, they facilitate interactions among group members and foster economic, social and psychological well-being through mutual accountability, moral support, and peer networks.

In this study, a women's collective enterprise, or women's economic collective, is defined as "a group of women who come together in a common economic activity such as those registered as a company or cooperative, or informal clusters that access markets together, drawing on business principles as well as leveraging social capital." Using this definition, we analyze the effects of providing paid formal employment and training through collectives on women's socioeconomic status in India using mixed-methods research strategy, including quantitative and qualitative surveys. We focus on India's handloom sector, which provides employment to over 3.1 million households (GoI 2020), most of which are in rural areas. Handloom production is primarily a small-scale, household-based activity with a low average income of approximately Rs.5,000 per month (GoI 2020).

This study focuses on women weavers, who constitute over 70 per cent of weavers and allied workers, but primarily engage in laborious but low-paid or unpaid allied work. They have limited autonomy in household businesses and often lack the technical weaving skills required to compete with expert designers in the sector (Banerjee et al. 2024). Moreover, these women miss out on institutional support for handloom weavers, as they are often not members of traditional handloom cooperatives (Dang, Patel, and Banerjee 2024). One potential way to address their challenges is through collectivization to provide technical, managerial, and marketing training, and provision of support throughout the value chain process.

In this study, we leverage Chitrika Foundation's project, "Creating agency of women in weaving value-chain in India"—funded under the International Initiative for Impact Evaluation (3ie)'s Swashakt Evidence Program—to understand the effects of providing paid work and training to women through collectivization in Southern India.[1]

The objective of this intervention was to address key challenges faced by weavers in the southern states of Andhra Pradesh and Telangana in India, including low wages and competition from modern technology. Chitrika has been functioning as an incubator of

[1] The proposed objectives of research under Swashakt were: to understand which forms of collective business models improve women's socioeconomic outcomes, and which types of interventions enhance the growth of collective business, thereby improving women's economic outcomes and social inclusion. The proposed research questions are described in Appendix B.

handloom and artisan enterprises, and has successfully incubated three collective enterprises in Andhra Pradesh and Telangana since its inception in 2006.

The collective enterprises are registered as producer companies (PCs). Services provided by Chitrika included skills training for weavers, providing them with access to modern weaving and value-addition technology in the form of a “craft hub,” and marketing. The collectives comprised 600 weavers from 300 households before inception of the Swashakt project in 2021.

Under Swashakt, the project planned to collectivize around 1,100 additional weavers, either by bringing them into the fold of existing collectives or forming new collectives between March 2021 and December 2023. The original planned evaluation strategy for the project was a randomized controlled trial (RCT) at the village level to generate “intention-to-treat” estimates of the program’s impact on women’s socioeconomic empowerment.

On the basis of the proposed RCT, a baseline survey of women and their spouses was conducted in 2021. However, due to several implementation challenges, Chitrika was unable to mobilize new members in all assigned treatment villages and carried out most of their implementation work in villages where they had already been working prior to 2021.

As a result, an RCT was no longer feasible, and we adjusted our strategy to a quasi-experimental method, using variations in villages where Chitrika had worked since 2006 (exposed group), versus those where they had never worked (control group). For the purposes of this study, we used data from our survey of women weavers and their spouses collected in January and August 2024, as well as Chitrika's management information system (MIS) data and qualitative interviews with implementers and PC members.

Using data collected from our endline survey of 2,390 women weavers and their spouses, and inverse probability weighted regression (IPWR) models, we estimated the effect of training and paid employment provided through women’s collectives on socioeconomic empowerment outcomes—including measures of women’s economic status, self-efficacy, knowledge about digital transactions, beliefs (own and spouse's) around women’s work, intimate partner violence, mental health, and aspirations for children.

While the exposed and control groups were balanced across several characteristics, IPWRs helped to address challenges related to other observed and unobserved differences in characteristics. Therefore, to address selection issues related to the non-random assignment of villages to exposed and unexposed groups, we use IPWR, where the weights are the inverse of the predicted probability of being exposed to Chitrika’s intervention.

The probability is predicted using a logit model with factors that are unlikely to be affected by exposure (e.g., participant's education level, age, number of sons under 18, number of daughters under 18, household head’s sex, and whether the participant has a child below the age of 10, or is a member of a self-help group [SHG]). For our main analysis, we also included several socioeconomic and demographic controls and district

fixed effects to account for other observable and unobservable factors that jointly determine women's socioeconomic status and their exposure status.

Our results demonstrated that the intervention had no significant effect on women's employment status, time spent on paid work, income, or savings. However, we found that women in the exposed group had loan amounts 2.7 times higher than those in the control group. In terms of women's confidence and digital access, our results suggested that the intervention increased women's enterprise self-efficacy by approximately 11.3 per cent, and knowledge about digital payment methods by 129 per cent.

We also found that women exposed to the intervention were more likely to believe that women can engage in paid work outside of the home, and to have better mental health. We did not find any effect on women's aspirations for their children. Our results are robust to multiple hypothesis correction tests using the Romano and Wolf method (2005a, 2005b, 2016) and placebo treatment assignments based on simulation methods proposed by Athey and Imbens (2017).

To understand the underlying mechanisms driving our results, we conducted key informant interviews (KIIs) with the implementation team to understand why we see limited effects on women's economic outcomes, but significant positive effects on other empowerment indicators such as self-efficacy and mental health. Our key takeaway from the conversation was that the COVID-19 pandemic significantly reduced weavers' incomes and their time spent on weaving activities due to a reduction in wages, and several took up work under the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) to obtain more stable income.[2]

Other employment guarantee schemes, pensions, and cash transfers from the government were more appealing since they offered greater income security. Chitrika also highlighted that since income did not increase in a continuous and sustainable manner, women's weaving-related aspirations for their children did not change. However, continuous engagement and interaction with women members (via training exercises) enhanced their non-economic empowerment by providing opportunities for critical thinking and knowledge sharing (Dang, Patel, and Banerjee 2024).The implementation team is hopeful that they will be able to alter economic outcomes in the future, since wages have begun to rise for the first time since COVID.

This study contributes to existing literature on the impact of utilizing women's groups as a medium to deliver various types of interventions, such as the provision of credit, training, and information on women's empowerment. Existing studies have examined the effects of women's groups on several indicators of women's empowerment, including economic empowerment, decision-making, bargaining power, domestic violence, mobility, health, subjective well-being, and household consumption and nutrition (Deininger and Liu 2013; de Hoop et al. 2014; Banerjee et al. 2015; Khanna, Kochhar, and Palaniswamy 2015; Jejeebhoy et al. 2017; Kochar et al. 2020; Bandiera et al. 2020; Hoffmann et al. 2021; Kochar et al. 2022; Deshpande, Khanna, and Walia 2023).

[2] MGNREGA, enacted in 2005 by the Indian government, is a scheme that guarantees 100 days of wage employment each financial year to adult members of rural households who volunteer to do unskilled manual work (Ministry of Rural Development).

A systematic review of the literature by Brody et al. (2016) suggests that SHGs have significant positive effects on economic, political and social empowerment, but not psychological empowerment. However, in contrast to quantitative studies, our qualitative findings suggest that SHGs may also contribute to women's psychological empowerment. This contributes to the literature by demonstrating that training and employment provided through collectives not only improve women's self-efficacy, but also improve their mental health and nudge them towards more equal gender norms.

2. Background: Chitrika Foundation

2.1 Inception

Chitrika Foundation's intervention is one of five scaled projects implemented through the "Swashakt: Empowering Indian Women's Collectives" program launched in 2020, which aims to enhance women's socioeconomic well-being by strengthening their economic collectives.

Chitrika was formed in 2006 as an incubator of handloom and artisan enterprises. Prior to this study, Chitrika successfully incubated two collective enterprises in Srikakulam and East Godavari districts of Andhra Pradesh, and one in Narayanpet district, Telangana. They worked with 600 women weavers from 300 households, and resultant products were sold through modern retail and wholesale channels under the Chitrika brand name.

These collectives were seeded as experiments to understand how SHGs can go beyond savings and credit activities to become livelihood solutions that empower women. The key activities undertaken by the collectives are: (1) procurement and processing of raw material; (2) doorstep delivery and collection of yarn and finished products; (3) on-loom and off-loom quality assurance; (4) consumption loans; (5) mobilization of finance for operations and investments; (6) design development; (7) management skilling; (8) marketing; and (9) technology support.

In East Godavari district, the Godavari Women Weavers' Services PC was registered in 2014 with 50 members. At the start of the project, the PC had a membership of 464, with an office in Mandapeta town and no common work shed facility. In Narayanpet, the Chitrika Artisans' PC was established in 2018, with a small work shed facility in Jajapur. The work shed and PC office were subsequently moved to Narayanpet town in 2019, with a membership of about 150 weavers and 30 looms currently in use. The PC in Srikakulam was formed in 2015 with all male members, and its membership criteria changed to only female members between 2018–2019.

2.2 Membership structure

Chitrika Foundation establishes women-owned PCs by recruiting women weavers and providing training in weaving and management techniques. PC membership is open only to those who meet the following selection criteria:

- Woman weavers, or women involved in any other weaving value-chain activities;
- Willing to pay the share capital required by the respective PC (each share is INR100); and
- Able to fulfill the minimum production requirement specified by the respective PC.

The PCs are owned by women members through shareholdings. Members select a board of directors to manage the PC based on their weaving performance and literacy. The board consists of a minimum of five members, and one additional external non-voting member, who is usually an external expert (e.g., from companies such as FabIndia or from the trader's side). The board hires other staff including the CEO and accountants, who report to them. We explain the structure and member roles in further detail in Chitrika's process evaluation report (Dang, Patel, and Banerjee 2024).

2.3 Income sources of members

Member compensation is primarily a piece-rate wage that varies by fabric design and is based on the number of finished products woven. In addition to income, women benefit from PC membership in other ways such as a compulsory savings scheme (with interest received on savings as well as the ability to borrow against accumulated savings at a zero interest rate), dividends earned on shares owned in the PC, and bonuses paid to select members for their design innovations.

3. Intervention and research design

3.1 Intervention

During the study period, Chitrika's aim was to collectivize an additional 1,100 women—either by inducting them into existing collectives or forming new collectives in Guntur and Krishna districts of Andhra Pradesh. The project aimed to raise women's annual incomes by 20 per cent, empower them to transition from low-paid/unpaid workers to decision-makers and owners of enterprises, and increase their intergenerational influence on the perception of weaving in their households and families. Appendix C presents the detailed theory of change.

The key components to achieving the project goals were:

1. Skilling for enterprise management through management, design and technology training; and
2. Establishing an Integrated Handloom Enterprise Hub and developing three value-addition units, a learning lab, and marketing infrastructure.

To achieve these goals, Chitrika implemented the following three main activities:

1. Scaled PCs
    - Improved accounting and business management systems: The project established advanced enterprise resources planning at the collective level to track enterprise outputs systematically, reduce dependency on middlemen for inputs, and provide learning opportunities.
    - Improved market linkages: Chitrika aimed to strengthen and generate new marketing channels for their products.
2. Launched Micro-MBA (Master of Business Administration) or Handmade MBA program for 100 selected women members to enhance their role in management of the PC and their own businesses.
    - Participants received training on 12 modules—accounts, design, human resources, legal, marketing, production, technology, skilling in handlooms, self-transformation, gender, governance, and sustainability—staggered over 4–6 months.

- Participants appeared for an end-of-program test on the first seven modules, and a practical component for the last five modules. Women were also graded for their class participation and attendance and were required to complete take-home assignments for some of the modules.
- Chitrika engaged industry professionals as well as PC staff for their trainings. An external trainer was identified for the design module and visited PCs to conduct the sessions. A dedicated PC member was identified for each of the modules on human resources, production, marketing, and technology, and visited different PCs to conduct trainings. The courses were short sessions, ranging from half a day to two days. The self-transformation, legal, governance, and gender modules were taught by external trainers in two week-long visits to Hyderabad at a common time for participants from all districts.
- The Chitrika team in Hyderabad designed all training modules after conducting a needs assessment in the field. No external consultants were hired to design the training modules for the first cohort, but they intend to hire one for the next round of the Handmade MBA program to design and implement the gender and self-transformation module.

3. Provided technical training through Integrated Handloom Enterprise Hub
    - Chitrika conducted half-day to one-day training courses on weaving techniques, technology, marketing, quality assurance, and value addition at the PC level. These courses do not have any selection criteria, and participants are roughly allocated/invited based on a needs assessment conducted during mobilization to identify the training required in different PCs.
    - Board of directors members received training related to writing vouchers, inventory management, governance, enterprise resources planning, and wage calculation.
    - For all training, Chitrika provided monetary compensation for wage losses.
    - Sessions usually include 15–45 participants.
    - PCs did not receive identical training; modules are selected based on need/product lines/interest.

Table 1 presents the types of training sessions conducted by the implementation partner, and the planned-versus-actual number of participants for each training.

Table 1: Trainings conducted by Chitrika during the calendar years 2021–2023

No.	Training type	Target for 2021–2024	Revised target for 2021–December 2023	Achieved during 2021–December 2023
1.	Handmade MBA	100	80	45
2.	Weaving techniques	545	545	567
3.	Soft technology	60	110	110
4.	Value addition	145	70	82
5.	Marketing	150	116	126
6.	Quality assurance	700	759	694
	Total	**1,700**	**1,680**	**1,624**

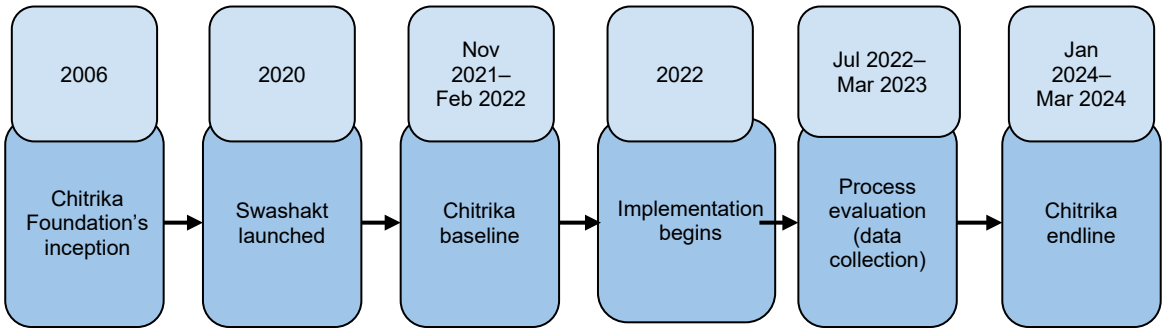
Source: Chitrika Foundation MIS Data

3.2 Research design

To evaluate Chitrika's program, 3ie intended to use a mixed-methods experimental approach. A cluster randomized method was to be employed to establish causality, in which villages were randomly assigned to the project (treatment) or not (control). The random assignment of villages was conducted at baseline before Chitrika started its mobilization work through Swashakt. The baseline surveys were conducted between November 2021 and March 2022. A snapshot of the project timelines is presented in Figure 1.

Detailed information about sampling at baseline is mentioned in Section 4.2. To understand the contextual factors that may influence project impact and implementation, 3ie intended to use qualitative methods such as KIIs and focus group discussion with project participants and non-participants. The findings from this were detailed in Chitrika's process evaluation report (Dang, Patel, and Banerjee 2024).

Figure 1: Timelines of the Chitrika project



Implementation was delayed and deviated from Chitrika's implementation goals due to challenges associated with the COVID-19 pandemic, mobilization of new members, and shortage of working capital. For example, the Integrated Handloom Enterprise Hubs were planned under the Swashakt project, but their implementation was not successful. Also, a key goal of the project was to recruit 1,100 new members as part of its expansion efforts, but only 366 new members were recruited in the project period (2021–2023). A majority of these new members were from villages where Chitrika had already been working, rather than the treatment villages identified at baseline.

Currently, Chitrika PCs have a total membership of about 980, with the Chitrika Artisans' PC's membership standing at approximately 525, and that of East Godavari PC and Srikakulam PC standing at about 295 and 160, respectively. Nearly 326 women from seven treatment villages were mobilized, of whom only 52 were surveyed at baseline. These women were mobilized less than a year before the endline survey.

Due to deviations from implementation goals, the empirical strategy and sample for the quantitative evaluation had to be revised.[3] An RCT was no longer feasible because of

[3] Since the process evaluation was conducted soon after baseline, the full extent of deviation from the implementation plan were not known. Thus, the sample villages for the process evaluation consisted of those randomly assigned at baseline (that is, villages where Chitrika had already conducted mobilization before Swashakt started were not included).

the low number of members mobilized from villages assigned to treatment at baseline. Mobilization activities could only be carried out in 7 of the 38 randomly assigned treatment villages. Thus, the quantitative evaluation in this report uses quasi-experimental methods.

Table 2 describes the details of the sample. The control sample consists of villages randomly assigned to the control group at baseline. Villages exposed to the intervention comprised seven that were randomly assigned to the treatment group at baseline (exposed village - type 1), as well as others where Chitrika had been mobilizing women even before the Swashakt project (villages that were not randomly selected for Swashakt) (exposed village - type 2).

Table 2: Types of villages in the sample

Type of village	Was the village randomly assigned to treatment or control at baseline?	No. of villages
Control village	Yes	31
Exposed village - type 1	Yes	7
Exposed village - type 2	No	25

4. Data description

4.1 Data sources

We developed four instruments that gather information on participants, their families, and their villages:

1. A women's questionnaire, administered at endline to Chitrika participants in the exposed villages and to women surveyed at baseline in control villages;[4]
2. A husbands' questionnaire, for responses from participants' husbands;
3. A village questionnaire, administered to a village leader to gather information on village infrastructure and demography; and
4. Focus group discussions and KIIs, which gathered implementation information from Chitrika field staff, participants, family members, and other value-chain actors.[5]

Women's questionnaire: This was fielded to Chitrika participants in the exposed villages, using participants' contact details (such as phone numbers and addresses provided by Chitrika). In the control villages, this questionnaire was administered to women surveyed at baseline. During baseline, the women's questionnaire was administered to an adult woman living in each household. If more than one woman met the age criterion, the data collection team interviewed whoever spent the most time working on entrepreneurial activities. If participation in entrepreneurial activities was equal or women did not participate in an enterprise, the older woman was selected.

[4] We did not use data collected from the baseline survey due to changes in the research design.
[5] These were developed by the research team and piloted with the help of Catalyst Management Services. The computer-assisted personal interview tools underwent several rounds of review by the research team before being fielded. We received institutional review board approval for our study from Catalyst Foundation.

The questionnaire is based on the Women's Empowerment in Agriculture Index for Value Chains. It is designed to capture women's participation in entrepreneurial activities, time use, physical mobility, and empowerment. The questionnaire was validated in Bangladesh, which we determined would suffice for use in India. However, we made several changes to adapt the tools to our context.

We removed questions on hijab-wearing and purdah and added contextually relevant questions. For example: (1) we amended the "self-efficacy" and "access to productive assets" modules with additional questions on social capital and ownership of assets associated with weaving and entrepreneurial activities; (2) we added codes for India-specific organizations such as Mahila Mandal (SHGs) to the "groups and collectives" module; (3) we added questions on weaving-related skills and equipment (e.g., spinning, dyeing, loom setting) to the "women's income" module; and (4) we added modules on norms related to women's work, weaving-related aspirations for children, gender-based violence, and mental health.

The questions on gender-based violence are based on the National Family Health Survey, and those on mental health are based on the Patient Health Questionnaire-4 scale by Kroenke et al. (2009).

Husband's questionnaire: This was fielded to participants' husbands. If the participant was unmarried, widowed, separated or divorced, the husband was unavailable during multiple survey attempts, or the husband refused to do the survey, then the questionnaire was fielded to the participant herself. It draws on the National Rural Livelihoods Project 2018–2019 endline surveys that were validated in the Indian context (Kochar et al. 2020). In addition to standard demographics (educational and occupational information about each household member), the project's household questionnaire collects information on household income sources (i.e., agriculture, livestock, casual/MGNREGA labor, self-employment) and individual members' participation in income-generating activities. The questionnaire also assesses the household's institutional linkages, ownership of assets, expenses, and the husband's time use. We also added modules on norms related to women's work and weaving-related aspirations for children.

Village questionnaire: This was fielded to a village leader, usually the *sarpanch* (village head). Similar to the household questionnaire, it is based on the National Rural Livelihoods Project 2018–2019 endline surveys that were validated in the Indian context (Kochar et al. 2020). The questionnaire collects information on infrastructure, prices of key products related to the program, and institutional linkages.

Chitrika MIS data: We leveraged Chitrika's management and administrative data to narrow down the list of active members. Chitrika provided us with information such as women's contact and address details, the number and type of trainings they attended, their PC name, and date of membership.

Qualitative tools: We developed guides for conducting in-depth interviews, focus group discussions and KIIs for our qualitative research team to administer to PC members, boards of directors, village heads, and key members of the Chitrika team, including program staff, employees, trainers and community mobilizers. These interview guides

were designed to collect information in randomly assigned treatment and control villages on participants, their spouses, their contexts, and project implementation (in treatment villages) to better understand project outcomes. We also conducted a KII with a key member of the Chitrika team to put the results of this study into perspective.

See Appendix G for the questionnaires used in this data collection round and report.

4.2 Sample and data summary

Our sample consists of 2,390 households from 60 villages across the East Godavari, Krishna, Guntur, and Srikakulam districts of Andhra Pradesh, and the Narayanpet district of Telangana, surveyed at endline. A husband-and-wife pair were to be surveyed from each household. The control sample consisted of 1,410 households in the 31 villages assigned to the control group at baseline.

The exposed sample consisted of 980 households. These households belong to 7 of the 38 villages randomly assigned to the treatment group at baseline, as well as 25 villages where Chitrika had been working prior to the Swashakt project (Table 2). During the endline, we were able to administer the questionnaire successfully to 1,938 households—approximately 81 per cent of the sample. These households form the dataset for our analysis in this report. The surveys were conducted between January 2024–August 2024.

Table 3 presents the characteristics of the exposed and control groups in our endline dataset. Our exposed and control groups are balanced on almost all characteristics except the *kuccha* (made from temporary and usually natural materials) or *pakka* (made from permanent materials) status of the home's walls and roofs, and the marital status of women. The homogeneity between the two groups could be potentially explained by the sampling strategy at baseline that accounted for Chitrika's membership criteria.

Specifically, prior to the baseline survey the selection of sample households was completed using a listing survey, which enabled us to screen households according to basic criteria for participation in the Chitrika project, including: (1) there must be a woman aged 18–55 residing in the household; and (2) the household should preferably be involved in weaving and/or own a loom. The selection of eligible households from the listing surveys, based on adherence to Chitrika's selection criteria, potentially generated a balanced sample of eligible households for the study.[6,7]

In Appendix table D1, we found that the exposed and control group villages are also homogeneous across various types of infrastructure available in the village. This potentially alleviates concerns around the non-random selection of villages by Chitrika for implementing their program, specifically based on village characteristics (e.g., availability of market, electricity).

[6] Chitrika provided the research team with a list of weavers in 124 villages spread across the five districts. These villages were located near the proposed locations for the centralized handloom hubs where Chitrika planned to work. We excluded the 30 villages where Chitrika was already working, and ranked villages based on their distance from the town in each cluster and retained the 16 closest villages for each cluster. This reduced our list of villages to 77 for randomization.
[7] Note that the sample was largely balanced at baseline as well.

Table 3 shows that in line with the selection criteria, women respondents in the dataset have an average age of 47 years and belong to weaving households. Eighty-six per cent of women belong to households where at least one member weaves, and 70% of women themselves weave. For these characteristics, the difference between the exposed and control groups is negative but not significant. Across both groups, very few women have young children. Only 1.6% of control-group women, and 2.2% of exposed women have a son under five years of age.

The proportions are similar for daughters under five, ranging between 1.5–2.8% for both groups. Women's educational attainment is also balanced across exposed and control groups, with women in both groups possessing approximately 4.6 years of education. Overall, 75% of women are members of SHGs. In the exposed group, women have been members of Chitrika for around 1.2 years and have attended roughly one training (1.4 on average).

The balance between the two groups is also reflected at the household level. The majority of homes belong to either scheduled caste (SC), scheduled tribe (ST), other backward castes (OBC), or minority caste categories, and this is balanced across control and exposed groups: 82% and 85% of homes, respectively.

Across both groups, only about 7% of homes have a member who reported that they worked in MGNREGA. Despite some differences in the two groups at the household level, they are not statistically significant. Compared to control homes, around 5% more exposed homes have female household heads. Fifteen per cent more exposed homes have an enterprise, although the number of weaving and non-weaving enterprises are the same across both groups.

There are statistically significant differences across the two groups in terms of women's marital status and household structure. Around 86 per cent of women in the control group and 80 per cent of women in the exposed group are married. Households in the exposed group are more likely to have *pakka* roofs and walls than those in the control group. To account for the statistically significant differences in these characteristics, we control for them, along with other variables, in the presence of district fixed effects. The full model is explained in Section 5.

Table 4 presents the differences between exposed and control groups for our outcomes of interest. The bottom of the table presents the means for household-level outcomes, such as household income, expenses, enterprise revenue, loans, land and assset ownership, and proportion of income saved. None of these show statistically significant differences. The two groups show differences in participant empowerment outcomes, such as the participant's self-efficacy related to running/managing enterprises and awareness about digital payment methods. Women in the exposed group answer approximately one more self-efficacy question in the affirmative compared to the control group. A higher proportion of exposed women possess knowledge of digital payment methods.

Table 3: Individual and household characteristics

	(1) Control	(2) Exposed	(2) - (1) Difference	(4) p-value	(5) Observations
Individual characteristics					
Participant married	0.863	0.805	-0.057*	0.057	1,864
Participant's age	47.733	45.374	-2.360	0.184	1,735
Participant weaves	0.781	0.766	-0.015	0.758	1,749
Participant's education	4.628	4.706	0.078	0.837	1,734
Participants with no education	0.345	0.384	0.039	0.290	1,734
Participant is a SHG member	0.770	0.802	0.032	0.517	1,851
Husband weaves	0.841	0.807	-0.035	0.603	1,537
Husband's education	6.421	6.348	-0.073	0.850	1,527
Household head weaves	0.813	0.759	-0.053	0.436	1,811
Sons under 5 (count)	0.016	0.022	0.005	0.718	1,812
Sons under 10 (count)	0.077	0.106	0.030	0.458	1,812
Sons under 18 (count)	0.218	0.299	0.081	0.287	1,812
Daughters under 5 (count)	0.015	0.028	0.012	0.267	1,812
Daughters under 10 (count)	0.077	0.119	0.042	0.299	1,812
Daughters under 18 (count)	0.217	0.308	0.091	0.242	1,812
Household characteristics					
Female-headed house	0.139	0.187	0.048	0.234	1,809
Household head's education	5.960	5.683	-0.276	0.264	1,809
SC/ST/OBC	0.824	0.855	0.031	0.420	1,818
House has *pakka* roof	0.712	0.786	0.074*	0.078	1,818
House has *pakka* floors	0.883	0.882	-0.001	0.983	1,818
House has *pakka* walls	0.886	0.942	0.056***	0.008	1,818
At least 1 female weaves	0.778	0.778	-0.000	0.993	1,811
At least 1 male weaves	0.760	0.674	-0.086	0.312	1,811
At least 1 member weaves	0.874	0.843	-0.031	0.516	1,811
At least 1 member worked in NREGA	0.066	0.068	0.002	0.959	1,811
Household has an enterprise	0.448	0.603	0.155	0.151	1,815
Number of enterprises	1.071	1.092	0.021	0.642	912
Number of weaving/allied enterprises	1.019	1.040	0.022	0.278	851
Household has land	0.126	0.087	-0.039	0.197	1,817
Prop of schemes availed (of 13)	0.271	0.268	-0.003	0.901	1,817

Note: This table reports simple differences in means of individual and household characteristics for the treated and control groups.
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Table 4: Economic and empowerment outcomes

	(1) Control	(2) Exposed	(2) - (1) Difference	(4) p-value	(5) Observations
Participant economic outcomes					
Participant works	0.904	0.920	0.017	0.534	1,864
Participant's total income	50,984.531	59,471.056	8,486.525	0.367	1,653
Participant's weaving income	46,913.725	56,084.367	9,170.642	0.382	1,549

	(1) Control	(2) Exposed	(2) - (1) Difference	(4) p-value	(5) Observations
Participant's savings	3,576.832	4,423.550	846.718	0.504	1,853
Participant's loans	62,685.141	73,251.333	10,566.192	0.312	1,854
Participant's formal loans	39,961.239	43,733.314	3,772.075	0.603	1,842
Participant's informal loans	23,853.273	30,658.815	6,805.541	0.244	1,792
Participant empowerment outcomes					
Enterprise self-efficacy (count)	5.732	6.519	0.787***	0.005	1,864
Household self-efficacy (count)	6.748	6.838	0.090	0.458	1,864
Community self-efficacy (count)	3.794	3.891	0.097	0.399	1,864
Daily household decisions-participant's inputs (count)	3.304	3.302	-0.001	0.994	1,864
Edu/Health decisions-participant's inputs (count)	1.810	1.958	0.148	0.396	1,840
Big expenses decisions-participant's inputs (count)	1.974	2.059	0.086	0.675	1,853
Permission needed to go out alone	0.742	0.719	-0.023	0.505	1,856
People who asked participant for help (count)	0.693	0.774	0.081	0.538	1,807
Friends in the village (excluding work/relatives)	3.538	3.668	0.130	0.689	1,848
Digital pay use awareness	0.051	0.122	0.072***	0.000	1,865
Participant's own beliefs	0.933	0.952	0.019	0.154	1,847
Participant's second order beliefs	0.813	0.816	0.003	0.906	1,670
Gender-based violence (proportion)	0.068	0.051	-0.016	0.305	1,170
Mental health (proportion)	0.349	0.302	-0.048	0.334	1,681
Household economic outcomes					
Household income	85,551.341	96,129.994	10,578.653	0.428	1,817
Household expenditure	114,590.844	112,355.237	-2,235.606	0.808	1,817
Weaving enterprise revenue	32,8373.769	96,795.924	-231,577.844	0.356	746
Household loan	80,751.844	84,762.427	4,010.584	0.717	1,807
Household land ownership	0.126	0.087	-0.039	0.197	1,817
Proportion of assets household owns (of 13)	0.454	0.452	-0.002	0.859	1,818
Proportion of household income saved	4.671	4.915	0.244	0.739	1,819

Note: This table reports simple differences in means of women's and household-level outcomes for the treated and control groups.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

5. Empirical strategy

5.1 Main specification

We use the dataset described in the previous section to estimate how training and paid employment through women's collectives influences their socioeconomic empowerment outcomes. We use the following specification:

$$(1) \qquad Y_{ivd} = \beta_0 + \beta_1 Exposure_{ivd} + \boldsymbol{\beta_2 X_{ivd}} + \boldsymbol{\delta_d} + \varepsilon_{ivd}$$

In equation (1), Y_{iv} is a measure of economic status, self-efficacy, own and spouse's beliefs around women's work, intimate partner violence, mental health, or aspirations for children of woman *'i'* residing in village *'v' in district 'd'*. The variable $Exposure_{iv}$ is equal to 1 if the woman was exposed to Chitrika's intervention and 0 otherwise. β_1 is the coefficient of interest that captures the effect of exposure to the intervention (i.e., the difference in the outcome of interest between the exposed and control groups).

$\boldsymbol{X_{ivd}}$ is a vector of controls, which include the participant's years of education, age, number of sons under 18, number of daughters under 18, home construction type, indicator for OBC/SC/ST of the household head, marital status of the respondent, whether the household head is female, whether the household has children under 10, and whether the participant is a member of any SHG—to account for various other observable factors that impact women's socioeconomic status and their choice to be affiliated with the PC and receive training. We also included district fixed effects ($\boldsymbol{\delta_d}$) to account for those unobservable differences across districts that jointly determine women's socioeconomic status and their exposure status.

Given that assignment to the intervention is non-random, a simple ordinary least squares (OLS) regression may not represent causal effects, due to unobserved differences in characteristics between the exposed and unexposed groups.[8] To address this challenge, we estimate Specification (1) using IPWRs, where the weights are the inverse of the predicted probability of being exposed to Chitrika's intervention (Hernan and Robins 2020).

The probability is predicted using a logit model with factors that are not likely to be affected by exposure, such as the participant's education level, age, number of sons under 18, number of daughters under 18, whether the household head is female, and indicators as to whether the participant has a child under 10 or is a member of an SHG.[9]

5.2 Correction for multiple hypothesis testing

Adjusting for multiple hypothesis testing in the presence of several outcome variables is important to avoid over-rejection of the null hypothesis. Several methodologies correct for multiple hypothesis testing, including the aggregate index approach, controlling for false discovery rate, and controlling for familywise error rate.

While we use indices whenever possible, it is also important to consider the dependence structures within the various families of outcomes, for example, women's economic

[8] We report the OLS regression in Appendix E.

[9] In future versions of the paper, we will also include village-level controls. We are still currently processing some data from the village-level surveys.

outcomes or measures of self-efficacy. To address the challenges associated with multiple hypothesis testing, we control for familywise error rate (i.e., the probability of rejecting at least one true null hypothesis in a family of hypotheses under test), using the method described by Romano and Wolf (2005a, 2005b, 2016).

The method uses resampling methods, such as bootstrap, to account for the dependence structure in the test statistics and control familywise error rate. In theory, this method is considered better than other familywise error rate correction methods because it offers more power or the ability to reject false null hypotheses (Clarke, Romano, and Wolf 2020; McKenzie, 2021). We report the Romano-Wolf adjusted p-values documented in Romano and Wolf (2016) for all our main results.[10]

6. Main results

In this section, we estimate the effects of the intervention on women's economic status, self-efficacy, beliefs around women's work, domestic violence, and mental health aspirations for children, using specification (1), described in Section 5.

6.1 Effect on women's economic status

As described in the theory of change (Appendix C), a key goal of the intervention was to improve women's income, asset ownership, and other measures of their economic well-being. Table 5 provides estimates of the effects of exposure to the intervention on women's economic status from IPWR using specification (1). We did not find any significant effect of program exposure (compared to the control group) on most indicators of women's economic well-being (e.g., whether the woman works for pay, time spent on paid and unpaid productive work, income, savings, and asset ownership).

Note that the proportion of women working in the control group is quite large at 90 per cent, which indicates that most women were already engaged in paid employment; therefore, the absence of a significant increase due to the intervention is unsurprising.

Our KII with the implementation team suggested that the lack of effects on economic outcomes could be due to the decline in weaving wages and time spent on weaving during the COVID-19 pandemic. They highlighted that since wages had decreased during COVID, weavers began taking up MGNREGA work. Other sources of income (MGNREGA, pensions, and other schemes) provided financial security and reduced weaving hours during the pandemic.

In addition, since at least 30 per cent of women PC members were eligible for pensions, they may have chosen to weave less and rely on these pensions. Nevertheless, the implementation team is hopeful, as wages have begun increasing this year for the first time since the pandemic, which should increase weavers' income going forward.

Interestingly, we found that while exposure increases women's access to formal loans, there is no effect on access to informal loans (Columns 7 and 8). Women in the exposed group have formal loan amounts that are 2.7 times higher than those of the control

[10] We used the rwolf2 command in Stata® with 3,000 bootstrap replications. This command is described in Clarke (2021).

group; this is consistent with the findings of Field, Jayachandran, and Pande (2010), who reported positive effects of business training on women's uptake of credit.

Hoffmann et al. (2021) also found that access to credit through government-led SHG programs increased women's take-up of formal loans and reduced informal credit in rural India, though the underlying mechanisms might be different from our study. Our KIIs with Chitrika team members suggested that increased loan amounts could be due to information and notes exchanged during training programs. Also, as mentioned in Section 2.3, PC members are eligible to borrow against accumulated savings at a zero-per cent interest rate, which may have potentially increased the value of formal loans taken by them.

Table 5: Effects on participant's economic outcomes

	(1) Works for pay	(2) Productive paid work hours	(3) Productive unpaid work hours	(4) Log total income	(5) Log total weaving income	(6) Log savings	(7) Log formal loans	(8) Log informal loans	(9) Asset ownership
Exposure	0.025	-0.143	0.263	-0.041	-0.001	0.082	0.981**	0.118	-0.008
	(0.029)	(0.281)	(0.471)	(0.170)	(0.180)	(0.302)	(0.457)	(0.341)	(0.027)
	[0.058]	[0.907]	[0.886]	[0.964]	[0.989]	[0.964]	[0.004]	[0.964]	[0.964]
Observations	1,654	1,655	1,655	1,469	1,383	1,644	1,636	1,590	1,589
R-squared	0.044	0.051	0.052	0.053	0.056	0.060	0.117	0.063	0.013
Control average	0.904	2.268	2.676	9.985	9.913	2.472	4.062	2.671	0.890
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Log = natural logs. This table reports the results from specification (1) using IPWR. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators as to whether the household belongs to OBC/SC/ST, the household head is female, the participant is married, has a child below the age of 10, or is a member of an SHG. The outcome in Column (1) is an indicator of whether the woman has participated in paid work; in Columns (2) and (3) it is hours spent in paid and unpaid work; in Columns (5) and (6) it is the log of participants' total income and income from weaving; in Column (7) it is the log of participants' savings; in Columns (8) and (9) it is the log of participants' formal and informal loans; and in Column (10) it is the proportion of productive assets the woman says she owns to that the household owns. The recall period for all outcomes is the last 12 months. Standard errors clustered by village are in parentheses ( ).
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.
The Romano-Wolf adjusted p-values are reported in brackets [ ].

6.2 Effect on women's self-efficacy

Table 6 reports the effect of exposure to the intervention on women's self-efficacy in terms of enterprise, household- and community-related decisions, and the ability to conduct digital transactions. We found that the intervention significantly increased women's enterprise self-efficacy by 6.5 percentage points compared with the control group (the exposed group has 11.3% higher self-efficacy) (Column 1, Table 6). While the coefficients on household and community self-efficacy are also positive, they are not

statistically significant (Columns 2 and 3, Table 6). Since the program includes soft technology training, Column (4) of Table 6 reports the effect of the intervention on women's ability to conduct digital transactions. We found that exposed women were 6.4 percentage points more likely than those in the control group to report the ability to conduct digital transactions (the control group mean is 5.1%).

A crucial benefit of using women's collectives as a medium of delivery for training or other interventions is the possibility of additional benefits from social networks and information exchange, such as increases in decision-making power or confidence beyond simple knowledge transfer (Brody et al. 2016; Díaz-Martin et al. 2023). Our implementation team validated this mechanism during the KII and underscored that women exchanged notes and information about design and technology during training sessions. Additionally, the training sessions enhanced participants' critical thinking, decision-making, and conflict resolution ability through the review of real-life case studies as a part of the training modules. The results from our qualitative analysis of the Handmade MBA training also suggest that women particularly appreciated the exposure visits to large retail stores (Dang, Patel, and Banerjee 2024).

Table 6: Effects on participant's self-efficacy outcomes

	(1) Enterprise self-efficacy	(2) Household self-efficacy	(3) Community self-efficacy	(4) Can conduct digital transactions
Exposure	0.065***	0.020	0.011	0.064***
	(0.024)	(0.012)	(0.015)	(0.015)
	[0.001]	[0.038]	[0.255]	[0.003]
Observations	1,655	1,655	1,655	1,655
R-squared	0.176	0.196	0.046	0.192
Control average	0.573	0.750	0.474	0.051
Controls	Yes	Yes	Yes	Yes
District	Yes	Yes	Yes	Yes

Note: This table reports the results from specification (1) using IPWR. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcome in Column (1) is the proportion of work- and enterprise-level self-efficacy statements that the participant has responded to with "strongly agree" or "agree;" in Column (2) it is the proportion of household-level self-efficacy statements that the participant has responded to with "strongly agree" or "agree," and in Column (3) it is the proportion of community-level self-efficacy statements that the participant has responded to with "strongly agree" or "agree." Example of statements: (a) I believe I can offer solutions to problems at work; (b) I feel I can make decisions regarding the education of my children; and (c) I frequently interact with the village health workers (e.g., accredited social health activists). The recall period for all outcomes is the last 12 months. In Column 4, the outcome variable is an indicator for whether the woman can use digital payment platforms. Standard errors clustered by village are in parentheses.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

The Romano-Wolf adjusted p-values are reported in brackets.

6.3 Effect on beliefs around women's work

Restrictive gender norms often constrain women's autonomy and labor market decisions. Their exposure to training and access to paid work in PCs can lead to more egalitarian gender norms through interaction with other women members, or greater confidence through exposure visits and participation in training. In Table 7, we examine the effects of exposure to the intervention on women's beliefs around women's participation in paid work outside the home.

While 93.2 per cent of respondents in the control group already believed that women can participate in paid work outside the home, we found that the intervention further strengthened this belief on women's work by 2.3 percentage points (Column 1, Table 7). During the KII, a member of the implementation team validated this finding, explaining that frequent interactions with PC board members may have enhanced women's social empowerment outcomes.

However, we did not find any significant effect of the intervention on women's perceptions about their husbands' beliefs around women's work (Column 2, Table 7). We speculate that a potential reason for this could be that as the intervention does not engage men, their beliefs on women's work outside the home may not have changed. In future versions of the study, we will estimate the effect of the intervention on men's beliefs.

Table 7: Effects on participant's beliefs around women's work

	(1)	(2)
	Believes women can work	Perceives that husband believes women can work
Exposure	0.023	0.026
	(0.015)	(0.035)
	[0.053]	[0.234]
Observations	1,638	1,514
R-squared	0.018	0.032
Control average	0.933	0.813
Controls	Yes	Yes
District fixed effects	Yes	Yes

Note: This table reports the results from specification (1) using IPWR. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, or the participant is married, has a child below the age of 10, or is a member of an SHG. The outcome in Column (1) is an indicator for whether the respondent believes women from her caste/community can work for pay outside her village, and Column (2) is an indicator for whether she believes that her husband believes that women can work for pay. Standard errors clustered by village are in parentheses.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

The Romano-Wolf adjusted p-values are reported in brackets.

6.4 Effect on women's mental health and domestic violence

Freedom from domestic violence and mental health are important indicators of women's well-being. In Table 8, we estimated the effect of the intervention on intimate partner violence and mental health issues. In Column (1), we found that women in the exposed

group reported 26.5 per cent lower exposure to intimate partner violence than the control group. Exposure to the intervention led to better health among women; Column (2) shows that women in the exposed group were 6.6 percentage points less likely to report experiencing mental health challenges compared with the control group, which is 18.9 per cent lower than the control average. While studies such as Jejeebhoy et al. (2017) have examined the effect of women's groups on domestic violence, we empirically show that paid employment and training provided through groups can also reduce mental health challenges for women.

Table 8: Effects on domestic violence and mental health among participants

	(1) Intimate partner violence index	(2) Mental health index
Exposure	-0.018	-0.066*
	(0.012)	(0.038)
	[0.066]	[0.031]
Observations	1,081	1,488
R-squared	0.041	0.044
Control average	0.068	0.349
Controls	Yes	Yes
District fixed effects	Yes	Yes

Note: This table reports the results from specification (1) using IPWR. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcomes in Columns (1) and (2) are the proportion of affirmative responses to the exposure to domestic violence questions and statements indicating mental health challenges. Standard errors clustered by village are in parentheses.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

The Romano-Wolf adjusted p-values are reported in brackets.

6.5 Effect on aspirations for children

Weaving is a highly skill-intensive process that requires expertise in a range of activities, including the ability to work with a loom, knowledge of different weaving techniques, and an understanding of how to create patterns and textures. Therefore, intergenerational transmission of skills is a crucial means of transferring traditional knowledge and weaving techniques, with parents historically passing these skills to their children (Greenfield 2006; Inanna et al. 2020; Dang, Patel, and Banerjee 2024). In Table 9, we examine the effects of the intervention on women's aspirations for their children. We did not find any effect of the intervention on women's aspirations for their children's engagement in weaving, which is potentially explained by null effects on economic outcomes in Table 1.

Table 9: Effects on participant's aspirations for children

	(1) Would like daughter to engage in weaving	(2) Would like son to engage in weaving
Exposure	-0.041	-0.032
	(0.035)	(0.038)
	[0.153]	[0.180]
Observations	1,129	1,267
R-squared	0.101	0.125
Control average	0.316	0.295
Controls	Yes	Yes
District fixed effects	Yes	Yes

Note: This table reports the results from specification (1) using IPWR. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcomes in Columns (1) and (2) are indicators for whether the participant would like her daughter and son to be engaged in weaving. Standard errors clustered by village are in parentheses.
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.
The Romano-Wolf adjusted p-values are reported in brackets.

6.6 Robustness check: Permutation test

As a robustness check, we used a placebo treatment assignment, which in this case was exposure to the intervention, as a falsification exercise based on a simulation exercise to confirm that our key results are not due to pure chance (Athey and Imbens 2017). We falsely assigned the exposure status to a randomly selected set of observations many times to re-estimate the effect of the placebo treatment on participants' socioeconomic outcomes of interest.[11] By design, multiple assignments to the exposure group are the source of variation in the model, which generates a p-value that can be interpreted as the probability that a similar-sized treatment effect would have been observed under different hypothetical assignments to exposure. We report the results from this exercise in Appendix F.[12] Reassuringly, most of our results remained statistically significant after running the placebo test.

7. Discussion

This study shows that providing paid work and training through collectives has enhanced women's social empowerment outcomes and access to credit in the weaving sector in India. Specifically, we show that the intervention improved women's self-efficacy, liberalized their beliefs around women's work, and improved their mental well-being. However, we did not find any effect of the intervention on women's economic outcomes, except access to formal loans. Our results should be interpreted as internally valid for a sample of women engaged in the handloom sector in India facing challenges associated with declining wages and competition from modern technology.

[11] We repeated this exercise 2,000 times based on findings from Young (2019), who demonstrated that typically 2,000 replications suffice to recover the non-parametric distribution of estimated effect size under placebo treatment.
[12] We used the "ritest" command in Stata® for randomization inference.

Based on the review of the literature and our qualitative interviews with the implementation team, these results are potentially explained by the social networks formed during training sessions provided through collectives. These networks foster exchange of information and moral support among PC members. The exposure visits to large retail stores and interactions with the board of directors also enhanced women's confidence and motivation.

The intervention's lack of effects on women's economic outcomes is potentially explained by the fall in wages for weavers during the COVID-19 pandemic. At this time, other sources of work and income may have become more attractive to weavers, whose wages had fallen. We did not see any effect on women's aspirations for their children's engagement in weaving.

These findings have several policy implications. First, as also highlighted in other studies, women's collectives can serve as a key medium for the delivery of interventions. Second, safety net programs could prevent weavers from looking for other work opportunities and protect the handloom industry during periods of adverse economic shocks. Third, higher wages for weavers are an important means of keeping the profession attractive to future generations. Finally, more broadly, a deeper understanding of the available employment opportunities and opportunity costs might help implementers and policymakers to design customized programs based on the local context and sectoral requirements.

One limitation of this study is its inability to fully address challenges in the empirical strategy associated with the implementation team's non-random selection of villages for exposure to the intervention. In future versions of this study, we will add additional information on village selection through KIIs and explore heterogeneity in the effects on women across other characteristics, such as education, number of training sessions attended, and membership duration. We will also focus on understanding other components of the intervention and examine its effects on men's outcomes, specifically their beliefs about women's employment.

Appendix A: Pre-analysis plan

The project description and the pre-analysis plan can be found here. Please note that there are significant deviations between this study and the pre-analysis plan due to reasons described in the paper.

Appendix B: Overview of the proposed evaluation approach for Swashakt

Research question	Research method	Data
1. What is the impact of the intervention on stated project outcomes of interest identified in the theory of change (Appendix C)?	Impact evaluation using experimental and qualitative methods, with counterfactual to examine whether outcomes changed due to the intervention	Quantitative data collected at baseline, midline and end line, and MIS data
2. How do women's economic collectives increase women's empowerment?	Development of the theory of change Examining the association between project outputs and outcomes Examining the validity of the assumptions of causal links	Qualitative data collected at baseline, midline and end line, and project documents
3. Why, or why not, did the observed impacts occur?	Process evaluation to examine whether the project implementation was per plan and whether identified project outputs were produced	Qualitative data collected at baseline, midline and end line, MIS data, KIIs, and focus group discussions
4. Were the observed impacts similar across caste and economic status at baseline?	Heterogeneity of impacts by caste and economic status of women	Quantitative and qualitative data collected at baseline, midline, and endline
5. Does gender and leadership training for female participants and their male family members lead to better economic outcomes for women?	Qualitative evaluation to understand impact and utility of training	Qualitative data collected at baseline and end line, KIIs, and focus group discussions

Appendix figure C1: Chitrika's theory of change



Appendix D: Village balance

Appendix table D1: Village-level balance table

	(1) Control	(2) Exposed	(2) - (1) Difference	(4) p-value	(5) Observations
Village accessible by road	0.917	0.833	-0.083	0.441	43
Village connected to highway	0.542	0.333	-0.208	0.185	43
Electricity in village	1.000	0.944	-0.056	0.321	43
Internet connectivity in village	0.792	0.833	0.042	0.738	43
Bank in village	0.875	0.556	-0.319**	0.026	43
Health subcenters in village	0.833	0.889	0.056	0.612	43
Primary health center in village	0.625	0.556	-0.069	0.661	43
Accredited social health activist in village	1.000	1.000	0.000	.	43
Hospital in village	0.250	0.278	0.028	0.845	43
Anganwadi in village	1.000	1.000	0.000	.	43
Primary school in village	1.000	1.000	0.000	.	43
Middle school in village	0.958	0.667	-0.292**	0.021	43
Secondary school in village	0.750	0.667	-0.083	0.570	43
Railway station in village	0.125	0.056	-0.069	0.438	43
Mandi (produce market) in village	0.292	0.278	-0.014	0.924	43
Market in village	0.625	0.500	-0.125	0.432	43
Police station in village	0.167	0.167	-0.000	1.000	43
Post office in village	0.833	0.889	0.056	0.612	43
Farm inputs shop in village	0.750	0.667	-0.083	0.570	43
Ration shop/ public distribution system in village	1.000	1.000	0.000	.	43
Veterinarian in village	0.542	0.500	-0.042	0.795	43
Vaccine distribution centre in village	0.958	1.000	0.042	0.325	43
Agri storage unit in village	0.417	0.222	-0.194	0.184	43
Non-agri storage unit in village	0.292	0.278	-0.014	0.924	43
Non-agri processing unit in village	0.250	0.389	0.139	0.355	43
Centralized loom in village	0.792	0.667	-0.125	0.384	43
Dyeing unit in village	0.208	0.167	-0.042	0.738	43

Note: This table reports simple differences in means of village-level characteristics for the treated and control groups. The village data is incomplete. The characteristics in this table are only for those villages from the sample where data was available.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Appendix E: OLS regressions

Appendix table E1: OLS: Effects on participants' economic outcomes

	(1) Works for pay	(2) Productive paid work hours	(3) Productive unpaid work hours	(4) Log total income	(5) Log total weaving income	(6) Log savings	(7) Log formal loans	(8) Log informal loans	(9) Asset ownership
Exposure	0.029	-0.115	0.260	-0.034	0.010	0.045	0.954**	0.137	-0.012
	(0.028)	(0.282)	(0.479)	(0.178)	(0.189)	(0.305)	(0.473)	(0.350)	(0.026)
Observations	1,654	1,655	1,655	1,469	1,383	1,644	1,636	1,590	1,589
R-squared	0.042	0.056	0.051	0.054	0.057	0.057	0.112	0.064	0.016
Control average	0.904	2.268	2.676	9.985	9.913	2.472	4.062	2.671	0.890
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Log = natural logs. This table reports the results from specification (1) using an OLS model. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcome in Column (1) is an indicator for if the woman has participated in paid work; in Columns (2) and (3) it is hours spent in paid and unpaid work; in Columns (5) and (6) it is the log of participant's total income and income from weaving; in Column (7) it is the log of participant's savings; in Columns (8) and (9) it is the log of participant's formal and informal loans; and in Column (10) it is the proportion of productive assets the woman says she owns to those the household owns. The recall period for all outcomes is the last 12 months. Standard errors clustered by village are in parentheses.
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Appendix table E2: OLS: Effects on participant's self-efficacy outcomes

	(1) Enterprise self-efficacy	(2) Household self-efficacy	(3) Community self-efficacy	(4) Can conduct digital transactions
Exposure	0.065***	0.020	0.009	0.067***
	(0.024)	(0.013)	(0.015)	(0.015)
Observations	1,655	1,655	1,655	1,655
R-squared	0.169	0.190	0.040	0.176
Control average	0.573	0.750	0.474	0.051
Controls	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes

Note: This table reports the results from specification (1) using an OLS model. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcome in Column (1) is the proportion of work and enterprise level self-efficacy statements that the participant has responded to with "strongly agree" or "agree;" in Column (2) it is the proportion of household level self-efficacy statements that the participant has responded to with "strongly

agree" or "agree," and in Column (3) it is the proportion of community-level self-efficacy statements that the participant has responded to with "strongly agree" or "agree." Example of statements: (a) I believe I can offer solutions to problems at work; (b) I feel I can make decisions regarding the education of my children; and (c) I frequently interact with the village health workers (like accredited social health activists). The recall period for all outcomes is the last 12 months. In Column (4), the outcome variable is an indicator for whether the woman can use digital payment platforms. Standard errors clustered by village are in parentheses.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Appendix table E3: OLS: Effects on participant's beliefs around women's work

	(1) Believes women can work	(2) Perceives husband believes women can work
Exposure	0.019	0.028
	(0.014)	(0.034)
Observations	1,638	1,514
R-squared	0.021	0.034
Control average	0.933	0.813
Controls	Yes	Yes
District fixed effects	Yes	Yes

Note: This table reports the results from specification (1) using an OLS model. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcome in Column (1) is an indicator for whether the respondent woman believes women from her caste/community can work for pay outside their village, and in Column (2) it is an indicator for whether she believes that her husband believes that women can work for pay. Standard errors clustered by village are in parentheses.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Appendix table E4: OLS: Effects on domestic violence and mental health

	(1) Intimate partner violence index	(2) Mental health index
Exposure	-0.016	-0.071*
	(0.012)	(0.040)
Observations	1,081	1,488
R-squared	0.040	0.029
Control average	0.068	0.349
Controls	Yes	Yes
District fixed effects	Yes	Yes

Note: This table reports the results from specification (1) using an OLS model. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcomes in Columns (1) and (2) are the proportion of affirmative responses to the exposure to domestic violence questions and statements indicating mental health challenges. Standard errors clustered by village are in parentheses.
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Appendix table E5: OLS: Effects on women's aspirations for children

	(1) Would like daughter to engage in weaving	(2) Would like son to engage in weaving
Exposure	-0.036	-0.028
	(0.036)	(0.041)
Observations	1,129	1,267
R-squared	0.112	0.128
Control average	0.316	0.295
Controls	Yes	Yes
District fixed effects	Yes	Yes

Note: This table reports the results from specification (1) using an OLS model. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcomes in Columns (1) and (2) are indicators for whether the participant would like her daughter and son to be engaged in weaving. Standard errors clustered by village are in parentheses.
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Appendix F: Permutation tests

Appendix table F1: Permutation test: Effects on women's economic outcomes

	(1) Works for pay	(2) Productive paid work hours	(3) Productive unpaid work hours	(4) Log total income	(5) Log total weaving income	(6) Log savings	(7) Log formal loans	(8) Log informal loans	(9) Asset ownership
Exposure	0.029	-0.115	0.260	-0.034	0.010	0.045	0.954	0.137	-0.012
	[0.032]	[0.428]	[0.117]	[0.745]	[0.924]	[0.813]	[0.000]	[0.583]	[0.318]
Observations	1,654	1,655	1,655	1,469	1,383	1,644	1,636	1,590	1,589
Control average	0.904	2.268	2.676	9.985	9.913	2.472	4.062	2.671	0.890
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Log = natural logs. This table reports the results from the permutation tests using the "ritest" command in Stata®. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcome in Column (1) is an indicator for if the woman has participated in paid work; in Columns (2) and (3) it is hours spent in paid and unpaid productive work; in Columns (4) and (5) it is the log of participant's total income and income from weaving; in Column (6) it is the log of the participant's savings; in Columns (7) and (8) it is the log of the participant's formal and informal savings; and in Column (9) it is the proportion of productive assets the woman says she owns to those the household owns. The recall period for all outcomes is the last 12 months. The p-values from the randomization inference tests are reported in brackets.
* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Appendix table F2: Permutation Test: Effects on self-efficacy and beliefs

	(1) Enterprise self-efficacy	(2) Household self-efficacy	(3) Community self-efficacy	(4) Can conduct digital transactions	(5) Believes women can work	(6) Perceives husband believes women can work
Exposure	0.065	0.020	0.009	0.067	0.019	0.028
	[0.000]	[0.047]	[0.387]	[0.000]	[0.138]	[0.206]
Observations	1,655	1,655	1,655	1,655	1,638	1,514
Control average	0.573	0.750	0.474	0.051	0.933	0.813
Controls	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the results from the permutation tests using the "ritest" command in Stata®. All regressions control for district fixed effects, the participant's education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcome in Column (1) is the proportion of work- and enterprise-level self-efficacy statements that the participant responded to with "strongly agree" or "agree;" Column (2) is the proportion of household-level self-efficacy statements that the participant has responded to with "strongly agree" or "agree;" and Column (3) is the proportion of community-level self-efficacy statements

that the participant has responded to with “strongly agree” or “agree.” Example of statements: (a) I believe I can offer solutions to problems at work; (b) I feel I can make decisions regarding the education of my children; and (c) I frequently interact with the village health workers (e.g., accredited social health activists). The recall period for all outcomes is the last 12 months. In Column (4), the outcome variable is an indicator for whether the woman can use digital payment platforms. The outcome in Column (5) is an indicator for whether the respondent believes that women from her caste/community can work for pay outside her village, and Column (6) is an indicator for whether she believes that her husband believes that women can work for pay. The p-values from the randomization inference tests are reported in brackets.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Appendix table F3: Permutation test: Effects on domestic violence, mental health and aspirations

	(1) Intimate partner violence index	(2) Mental health index	(3) Would like daughter to engage in weaving	(4) Would like son to engage in weaving
Exposure	-0.016	-0.071	-0.036	-0.028
	[0.233]	[0.001]	[0.158]	[0.253]
Observations	1,081	1,488	1,129	1,267
Control average	0.068	0.349	0.316	0.295
Controls	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes

Note: This table reports the results from the permutation tests using the “ritest” command in Stata®. All regressions control for district fixed effects, the participant’s education level, age, number of sons under 18, number of daughters under 18, kuccha/pakka status of the walls, floors, and roof, and indicators for whether the household belongs to OBC/SC/ST, the household head is female, and the participant is married, has a child below the age of 10, or is a member of an SHG. The outcomes in Columns (1) and (2) are the proportion of affirmative responses to the exposure to domestic violence questions and statements indicating mental health challenges. Columns (3) and (4) are indicators for whether the participant would like her daughter and son to be engaged in weaving. The p-values from the randomization inference tests are reported in brackets.

* Significant at 10%; ** Significant at 5%; *** Significant at 1%.

Appendix G: Instruments

G1: Endline husband questionnaire

https://3ieimpact.org/sites/default/files/2024-09/Appendix-G-husband_el_chitrika.pdf

G2: Endline women questionnaire

https://3ieimpact.org/sites/default/files/2024-09/Appendix-G-wife_el_chitrika.pdf

G3: Endline village questionnaire

https://3ieimpact.org/sites/default/files/2024-09/Appendix-G-village_el_chitrika.pdf

References

Athey, Susan, and Guido W. Imbens. 2017. "The state of applied econometrics: Causality and policy evaluation." *Journal of Economic Perspectives* 31 (2): 3–32.

Bandiera, Oriana, Niklas Buehren, Robin Burgess, et al. 2020. "Women's empowerment in action: Evidence from a randomized control trial in Africa." *American Economic Journal: Applied Economics* 12 (1): 210–59.

Banerjee, Abhijit, Esther Duflo, Rachel Glennerster, and Cynthia Kinnan. 2015. "The miracle of microfinance? Evidence from a randomized evaluation." *American Economic Journal: Applied Economics* 7 (1): 22–53.

Banerjee, Shreya, Aastha Dang, Jane Hammaker, et al. 2024. "Weaving through generations: Productivity gains in family-owned businesses in rural India." *Ideas For India*, February 1. https://www.ideasforindia.in/topics/productivity-innovation/weaving-through-generations-productivity-gains-in-family-owned-businesses-in-rural-india.html.

Brody, Carinne, Thomas de Hoop, Martina Vojtkova, et al. 2016. "Can self-help group programs improve women's empowerment? A systematic review." *Journal of Development Effectiveness* 9 (1): 15–40.

Clarke, D. 2021. rwolf2 Implementation and flexible syntax. Unpublished.

Clarke, Damian, Joseph P. Romano, and Michael Wolf. 2020. "The Romano-Wolf multiple hypothesis correction in Stata." *The Stata Journal* 20 (4): 812–43.

Dang, Aastha, Fatema Patel, and Shreya Banerjee. 2024. *Understanding women-run weaving enterprises in Andhra Pradesh and Telangana.* 3ie Process Evaluation Report. New Delhi: International Initiative for Impact (3ie). http://doi.org/10.23846/SCPE07.

de Hoop, Thomas, Luuk van Kempen, Rik Linssen, and Anouka van Eerdewijk. 2014. "Women's autonomy and subjective well-being: How gender norms shape the impact of self-help groups in Odisha, India." *Feminist Economics* 20 (3): 103–135.

Deininger, Klaus, and Yanyan Liu. 2013. "Evaluating program impacts on mature self-help groups in India." *The World Bank Economic Review* 27 (2): 272–96.

Deshpande, Ashwini, Shantanu Khanna, and Daksh Walia. 2023. *An Indian enigma? Labour market impacts of the world's largest livelihoods program*. GLO Discussion Paper No. 1311. Essen: Global Labour Organization (GLO).

Díaz-Martin, Lucía, Akshara Gopalan, Eleonora Guarnieri, and Seema Jayachandran. 2023. "Greater than the sum of the parts? Evidence on mechanisms operating in women's groups." *The World Bank Research Observer* 38 (1): 1–35.

Field, Erica, Seema Jayachandran, and Rohini Pande. 2010. "Do traditional institutions constrain female entrepreneurship? A field experiment on business training in India." *American Economic Review* 100 (2): 125–29.

Greenfield, Patricia M. 2006. "Weaving generations together: Evolving creativity in the Maya of Chiapas." Paper presented at the 10th Biennial Symposium of the Textile Society of America, Toronto, Ontario, October 11–14.

Hernan, Miguel, and Jamie Robins. 2020. *Causal inference: What if.* Boca Raton: Chapman & Hall/CRC.

Hoffmann, Vivian, Vijayendra Rao, Vaishnavi Surendra, and Upamanyu Datta. 2021. "Relief from usury: Impact of a self-help group lending program in rural India." *Journal of Development Economics* 148: 102567.

IFPRI Guides and Instruments. n.d. Women's Empowerment in Agriculture Index. https://ars.els-cdn.com/content/image/1-s2.0-S0305750X19301706-mmc1.docx.

Inanna, I., R. Rahmatullah, M.I.M. Haeruddin, and M. Marhawati. 2020. "Silk weaving as a cultural heritage in the informal entrepreneurship education perspective." *Journal of Entrepreneurship Education* 23 (1): 1–11.

Jejeebhoy, Shireen, K.G. Santhya, Rajib Acharya, et al. 2017. *Empowering women and addressing violence against them through self-help groups (SHGs).* New Delhi: Population Council. https://knowledgecommons.popcouncil.org/departments_sbsr-pgy/506/.

Khanna, Madhulika, Nishtha Kochhar, and Nethra Palaniswamy. 2015. "A retrospective impact evaluation of the Tamil Nadu empowerment and poverty alleviation (Pudhu Vaazhvu) Project." *Journal of Development Studies* 51 (9): 1210–23.

Kochar, Anjini, Bidisha Barooah, Chandan Jain, et al. 2020. *Impact evaluation of the National Rural Livelihoods Project.* 3ie Impact Evaluation Report 128. New Delhi: International Initiative for Impact Evaluation (3ie). https://www.3ieimpact.org/evidence-hub/publications/impact-evaluations/impact-evaluation-national-rural-livelihoods-project

Kochar, Anjini, Closepet Nagabhushana, Ritwik Sarkar, Rohan Shah, and Geeta Singh. 2022. "Financial access and women's role in household decisions: Empirical evidence from India's National Rural Livelihoods project." *Journal of Development Economics* 155: 102821.

Kroenke, Kurt, Robert Spitzer, Janet Williams, and Bernd Löwe. 2009. "An ultra-brief screening scale for anxiety and depression: the PHQ-4." *Psychosomatics* 50 (6): 613–21.

McKenzie, David. 2021. "An updated overview of multiple hypothesis testing commands in Stata." *World Bank*, July 20. https://blogs.worldbank.org/en/impactevaluations/updated-overview-multiple-hypothesis-testing-commands-stata

Ministry of Textiles, Government of India. (2020). *Fourth All India Handloom Census.*

International Institute for Population Sciences (IIPS) and ICF. 2022. *National Family Health Survey (NFHS-5), 2019-21, India report*. Mumbai: IIPS. https://dhsprogram.com/publications/publication-FR375-DHS-Final-Reports.cfm

Romano, Joseph, and Michael Wolf. 2005a. "Exact and approximate stepdown methods for multiple hypothesis testing." *Journal of the American Statistical Association* 100 (469): 94–108.

Romano, Joseph, and Michael Wolf. 2005b. "Stepwise multiple testing as formalized data snooping." *Econometrica* 73 (4): 1237–82.

Romano, Joseph, and Michael Wolf. 2016. "Efficient computation of adjusted p-values for resampling-based stepdown multiple testing." *Statistics and Probability Letters* 113: 38–40.

Kucey, Andrea, Abhilasha Sahay, Brett Libresco, Diego Javier Ubfal, Chiara Broccolini, and Jennifer Solotarof. 2023. *Gender equality in development: A ten-year retrospective.* Washington, DC: World Bank Group.

Young, Alwyn, 2019. "Channeling Fisher: Randomization tests and the statistical insignificance of seemingly significant experimental results." *The Quarterly Journal of Economics* 134 (2): 557–98.

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