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Can Farmer Collectives Empower Women and Improve Their Welfare?

Mixed Methods Evidence from India

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ABSTRACT

Farmer Producer Organizations (FPOs)—farmer collectives, often legally registered - can mitigate some of the constraints smallholder farmers face by improving their access to extension, services, and markets, especially for women. We evaluate the effects of a set of interventions delivered through women-only FPOs in Jharkhand, India, using a panel of 1200 households and a difference-in-difference model with nearest neighbor matching. A complementary qualitative study in the same areas helps triangulate and interpret our findings. The interventions aimed to improve agricultural productivity by coordinating production and improving access to services, while also providing gender sensitization trainings to FPO leaders and members. We collect household data on asset ownership and agricultural outcomes and individual data on women's and men's empowerment using the project-level Women's Empowerment in Agriculture Index for Market Inclusion (pro-WEAI+MI). Our results for asset ownership, land cultivated, cropping intensity, and per acre yields, revenues or costs are statistically insignificant. Effects on men's and women's empowerment are mixed. While we see positive effects on women's decisionmaking, asset ownership, control over income and attitudes towards intimate partner violence, the program is associated with an increase in workload and a reduction in active group membership for both men and women. Men appear to cede control over resources and decisionmaking to other household members. Additional analyses suggest that while some effects can occur in the short-term, others take time to accrue. FPO-based interventions that aim to empower women or other marginalized groups likely require sustained investments over multiple years and will need to go beyond improving FPO functioning and increasing women's participation to transforming social norms.

JEL codes: O13, Q13

Keywords: India, agriculture, farmer cooperatives, markets, prices, yield, empowerment

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ACRONYMS

ANEW	Applying New Evidence on Women's Empowerment
DiD	Difference-in-difference
FGD	Focus Group Discussions
FPO	Farmer Producer Organization
GoI	Government of India
INR	Indian Rupee
LEAP	Livelihoods Enhancement through market Access and women emPowerment
NGO	Non-Governmental Organization
NNM	Nearest Neighbour Matching
OLS	Ordinary Least Squares
PG	Producer Group
PLA	Participatory Learning Approach
PRADAN	Professional Assistance for Development Action
pro-WEAI+MI	project-level Women's Empowerment in Agriculture Index for Market inclusion
SHG	Self-Help Group
SSI	Semi Structured Interviews

1 INTRODUCTION

Farmer cooperatives are increasingly being leveraged to improve smallholder farmer outcomes through improved extension, linkages to and reduced transaction costs of engaging in input and output markets, and the promotion of improved technologies. Cooperative models have been present globally in various forms for a century (Burchi & Vicari, 2014), however, the last decade or so has seen renewed interest among donors, multilateral organizations and governments in supporting and studying these collective organizations, especially farmer producer organizations or FPOs (Bernard & Spielman, 2009; FAO, 2012; World Bank, 2008). In India too, recent national government-led initiatives have given impetus to FPO-led interventions (GoI, 2013, 2020; Verma et al., 2019). In the Indian context, FPOs (also called Farmer Producer Companies, FPCs) are legally registered collectives of farmers living in close proximity, that help coordinate extension, production and sales for their members.[1]

There is considerable potential for FPOs to improve outcomes for smallholder farmers in India. More than 80 percent of India's farmers cultivate less than two hectares (GoI, 2019), making efficient input use and the use of mechanization challenging (Desai & Joshi, 2014). Smallholder farmers may be less able to benefit from the higher productivity, greater specialization and higher incomes that come from improved market linkages (Barrett, 2008; Bernard & Spielman, 2009), due to inadequate infrastructure, limited access to credit, lack of information and uneven power dynamics, low volumes of production and high relative costs of aggregation and transportation (Trebbin, 2016; World Bank, 2008). Women farmers in India are particularly disadvantaged in terms of access to resources to support their participation (Desai & Joshi, 2014; Kanchi, 2010; Narayanan & Srinivasan, 2021). Fewer than 14% of the operational holders are women (GoI, 2019), and compared to men, women have lower access to agricultural information (Raabe, 2008) and credit (Desai & Joshi, 2014), lower decisionmaking power within the household and limited mobility outside of it (Kanchi, 2010). Mobilizing women into FPOs and improving their access to

[1] In India, FPOs can be registered as collectives, companies or trusts, with slightly different legal and financial implications, but broadly similar functioning. FPOs are typically (but not always) differentiated by the primary produce of the member farmers, so one could have a dairy, poultry or agriculture FPO.

information and services could be transformational, especially when combined with gender-sensitive programming.

We use panel data on women and men from close to 1200 households in Jharkhand, India, to evaluate the impacts of agriculture and gender-focused interventions delivered through women-only FPOs on household-level asset ownership and agricultural outcomes and women's and men's empowerment. We supplement this with findings from qualitative analysis of semi-structured interviews and focus group discussions with 118 women and 15 men in the same study regions to better understand the study context and potential pathways to impact (or reasons for a lack thereof). The FPOs we study are large, covering between 1500 to 5000 women farmers each, and provide a range of services to their members, including crop planning and extension, aggregation of farm produce at the farmgate, input and output market linkages, and improved price realization through enhanced bargaining power. In addition, the NGO supporting these FPOs recently incorporated gender trainings to improve women's empowerment within the cooperative, the household, and the community. These trainings focused on recognizing women as farmers, improving their input into decisionmaking, enhancing their control over use of income and encouraging men to share the burden of care work.

We use difference-in-differences with nearest neighbor matching, comparing women members of FPOs that implemented these interventions with women in control areas where these FPOs were not operating. Our analysis is complicated by the fact that the process of forming and strengthening the FPOs started about a year before our baseline; indeed, we find that treatment households are doing better on asset and agricultural outcomes at both baseline and endline, though control households narrow the gap over time. As a result, we refrain from making causal claims. Even after correcting for possible placement and selection bias, we find little to no improvement in household asset ownership, land cultivated, cropping intensity, or per acre yields, revenues or costs of cultivation. Results on empowerment outcomes are mixed. We find positive effects on women's decisionmaking, asset ownership, control over income and attitudes towards intimate partner violence, but the program is associated with an increase in workload and a reduction in active group membership for both men and women, though there is no

evidence that FPOs are "crowding out" other groups. Men appear to cede control over use of income and decisionmaking to other household members.

Our paper contributes to a large and growing literature on the impacts of membership in farmer collectives. Globally, evidence comes from several countries - China, Ethiopia, Kenya, Ghana, Italy, Peru, Uganda, and from livestock and staple, horticultural and cash crops. Membership is positively associated with price realization (Bernard et al., 2008; Fischer & Qaim, 2014), incomes (Hoken & Su, 2018; Ma & Abdulai, 2016), yield, productivity, and technical efficiency (Abate et al., 2014; Falco et al., 2008; Grashuis & Skevas, 2023; Mishra et al., 2018), input use and technology adoption (Abebaw & Haile, 2013; Falco et al., 2008; Fischer & Qaim, 2012), commercialization (Grashuis & Skevas, 2023), empowerment (Abdu et al., 2022; Ferguson & Kepe, 2011) and food security (Anim et al., 2016; Shumeta & D'Haese, 2018). Of the range of different services cooperatives provide, marketing access and the provision of market information appear critical (Bizikova et al., 2020). Impacts are heterogeneous by farm size and age of the group (Bernard et al., 2008; Candemir et al., 2021; Fischer & Qaim, 2012, 2014), and there is some evidence of cooperatives excluding the poorest of the poor (Bernard & Spielman, 2009; Minah, 2022).

In India, too, the evidence base is substantial. FPO membership in Bihar is associated with increased adoption of improved agricultural practices, crop management and protection technologies, though it does not ease credit constraints (Verma et al., 2019). Membership in producer collectives in Gujarat is associated with improved member awareness of financial instruments and loan-taking and increased output, but income effects are concentrated among women who had been members for more than six months (Desai & Joshi 2014). Membership in dairy cooperatives is associated with increases in yield, returns and adherence to food safety norms in Bihar, in line with earlier studies of dairy cooperatives (Kumar et al., 2018), and with increases in joint decisionmaking in dairy production and over household expenditures in Karnataka (Dohmwirth & Liu, 2020). In Maharashtra, collectivization helped smallholder grape farmers achieve quality control and food safety certification standards (Narrod et al., 2009), while supporting higher incomes (Roy & Thorat, 2008).

The literature on social impacts of farmer collectives is somewhat smaller, but studies show that membership in farmer producer cooperatives is associated with greater decisionmaking and confidence and improved intra-household gender relations (Burchi & Vicari (2014) in Brazil; Ferguson & Kepe (2011) and Lecoutere (2017) in Uganda; Mwambi et al. (2021) in Kenya; Serra & Davidson (2021) in Ethiopia). The bulk of the evidence in South Asia comes not from farmer collectives, but from women's groups, often microfinance-focused self-help groups (SHGs). While this may appear not immediately relevant, the FPOs we study in this paper only accept members from within the SHG-fold, thereby linking the two types of collectives inextricably. In a systematic review of qualitative and quantitative studies, Brody et al. (2017) highlight positive effects of membership in women's SHGs on their economic and political empowerment, mobility, and control over reproductive decisions. Participation in women's groups, especially when participatory learning approach-style interventions are delivered at the group level, is also associated with increased women's empowerment, especially their independence and ability to negotiate with family members (Kumar et al. (2021) in India; Morrison et al. (2010, 2019) in India, Nepal, Bangladesh and Malawi), though the impact may be limited in the long-term (Gram et al. (2019) in Nepal).

The issue with FPO studies is not their volume, however, but their quality. Most studies struggle to demonstrate causality (Grashuis & Su, 2019), and very few use randomized controlled trials (Abraham et al., 2022). Selection bias is a common concern. Our advantage lies in the use of panel data and in our multistage sampling and matching methods that help reduce both selection and placement bias. We extend the existing work in two important ways: we provide quantitative evidence on the association of FPO-delivered interventions with women's empowerment, a gap in the literature (Abraham et al., 2022), and we integrate the findings from a complementary qualitative study, adding further insights to several of our quantitative results.

2 CONTEXT

2.1 Background of FPOs in India

In the early 2000s the Indian government started promoting Farmer Producer Organizations (FPOs) as an alternative to the Primary Agricultural Credit Societies that had been functioning since the early 1990s (Deka et al., 2020). The Department of Agriculture and Cooperation issued policy guidelines for FPOs in 2013 (GoI, 2013), and the number of FPOs grew ten-fold between 2014 and 2019 (Deka et al., 2020), with the majority of them registered as Producer Companies (NABARD, 2019). Further guidelines to support the formation of 10,000 FPOs were issued in 2020 (GoI, 2020), and the 2023-24 budget saw explicit mention of a cooperative-based approach to improving smallholder farmer welfare (Ministry of Finance, 2023). At present, it is estimated that there are more than 33,000 FPOs in India, with a total revenue of close to INR 40 billion.[2]

2.2 Applying New Evidence for Women's Empowerment (ANEW)

The ANEW project began in 2021 to develop metrics to measure women's empowerment in the context of collective-based high value market-oriented agriculture, and to generate evidence on the potential of FPOs and other agricultural collectives to improve women's empowerment and economic outcomes. The ANEW portfolio consists of four related studies in Guatemala, India, and Mexico that focus on high-value commodities sold via FPOs or other agricultural collectives and have a specific women's empowerment focused intervention component. ANEW provided support to each project for a mixed-methods (quantitative and qualitative) evaluation. In addition, ANEW built on the project-level Women's Empowerment in Agriculture Index for Market inclusion (pro-WEAI+MI) (Malapit et al., 2023) to develop additional indicators relevant to high-value commodities and to collectives. This paper focuses on

[2] https://fpo.tci.cornell.edu/. As of August 13, 2024, 1 USD = 83.97 INR.

the results of one of the ANEW projects in India and uses these newly developed women's empowerment metrics.

2.3 PRADAN's FPO engagement and our theory of change

The FPOs featured in this paper are supported by the NGO Professional Assistance for Development Action (PRADAN) that works with remote and marginalized populations in several states of India to form and strengthen women's collectives. PRADAN's Livelihoods Enhancement through market Access and women emPowerment (LEAP) project began in 2020 and was implemented in 10 districts across three large eastern Indian states - Odisha (4 districts), West Bengal (2 districts), and Jharkhand (4 districts) - with the aim of increasing incomes of smallholder women farmers working in vegetable, fruit, cereal, and livestock value chains. Most of the population in these areas is rural and relies on rain-fed farming with a focus on paddy and with limited crop diversification.

LEAP supports the formation and strengthening of women producer groups of 30-50 women farmers at the village level, occasionally straddling adjacent villages. All producer groups within a block – a sub-district administrative level in India – are then incorporated under the block-level FPO. FPOs have a board of directors and several thematic managers, financial officers, and other administrative staff to support their functioning. Women SHG members can join these farmer collectives provided they are engaged in farming, though only one woman per household can be an FPO member.

In this study we focus on PRADAN-supported FPOs in Jharkhand, where three sets of interventions were provided to women farmers: the strengthening of collective organizations and their establishment as strong rural institutions, agriculture interventions to streamline and increase production, and the gender-focused interventions introduced above. Since these interventions are bundled, we can only identify the impact of the full set and not of each component individually.

2.3.1 Strengthening collective organizations

PRADAN helps FPOs register; formalize structures and processes; develop business and enterprise resource plans, financial systems, and monitoring information systems; and ensure compliance with tax, license and statutory audit regulations. PRADAN also links FPO members to banks and other formal credit institutions, market actors, agricultural service providers, relevant government departments and agricultural research institutes. These inputs and processes streamline the regularized functioning of the FPO and establish it as a strong rural institution that supports and enhances livelihoods opportunities for member farmers.

2.3.2 Agriculture interventions

The agriculture interventions include introducing crop calendars, choosing varieties to promote ("winner crops"), providing training on crop and post-harvest practices and access to services and markets. The FPO facilitates the provision of services through the identification and selection of local service providers who supply inputs or other services like spraying pesticides, improved market linkages and improved linkages to private and institutional actors providing financial and digital services.

As a result, individual farmers are expected to have improved knowledge of agronomic practices, access to both individual and group-level infrastructure, and backward and forward linkages to markets and service providers. In the long term, these interventions are expected to increase agricultural yield and profits and enhance asset accumulation at the individual and the community or group level.

2.3.3 Gender-related interventions

The third set of LEAP interventions aim to improve women's empowerment and gender relations. Since FPOs are relatively new institutions, PRADAN first aims to improve women's own appreciation of their identity as farmers and as entrepreneurs. After that, discussions are initiated around women's status within the household, their control over resources and assets, their participation in agricultural decision-

making, and the shared burden of domestic work. PRADAN developed a set of gender modules used to sensitize FPO board members to gender issues and to their own role in promoting women farmers and entrepreneurs. Following this, dedicated community resource persons were expected to provide village-level trainings to women SHG members. The interventions are expected to improve perspectives on women's agency and role in agriculture among members and FPO membership and enhance understanding of their own identities as farmers and entrepreneurs, leading, in the long term, to women's increased control over assets and decisionmaking in agriculture, and to a more equitable sharing of the work burden within the household.

3 DATA AND METHODS

3.1 Quantitative survey design

The quantitative impact evaluation sought to identify the impact of PRADAN's LEAP interventions on household asset accumulation, agricultural outcomes, and women's empowerment, relative to the control arm.

3.1.1 Sample

We conducted our study in Khunti, Gumla, and Ramgarh districts (Figure 1), where PRADAN supports three FPOs. These areas are hilly, and landholdings are predominantly small and of marginal quality. With limited irrigation facilities and low rainfall, farmers rely on mono-cropped subsistence farming, livestock rearing and seasonal out-migration. Each FPO corresponds roughly to a block, except for Gumla FPO which has members from Gumla and Raidih blocks (Table 1).

To correct for possible placement bias in the LEAP program, we selected three control blocks that matched the three treatment blocks along a set of ten indicators obtained from publicly available secondary data.[3] We ranked each block on ten dimensions, calculated an equally weighted sum of the rankings and selected the three control blocks closest in rank to the treatment blocks[4] within the same district.

[3] The secondary indicators used include SHGs with bank linkages per 10,000 people (NRLM, 2021), Scheduled Caste and Tribe proportions (SECC 2011), female literacy rate (Census 2011), households with income >Rs 10,000 (SECC 2011), households with land (SECC 2011), commercial bank branches per block (Garg and Gupta (2020); Asher et al (2021)), female main agricultural labor proportion (Census 2011), female landholdings as % of total (Agriculture census, 2015-16), and minimum distance to nearest place with >10,000 population (Census 2011).

[4] The FPO at Gumla straddles two blocks, which presented complications in conducting this matching exercise. Since the bulk of the women members in that FPO came from Gumla, not Raidih, we opted to match the control block to Gumla.

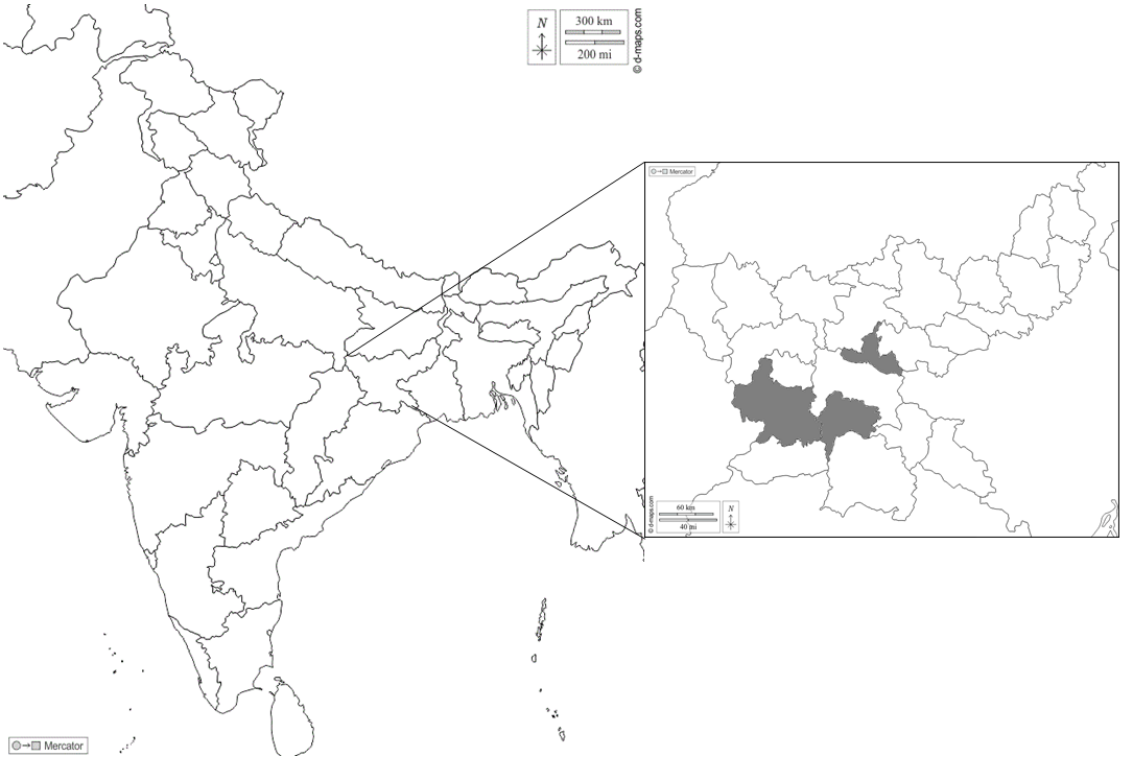

Figure 1: Map of India, with Jharkhand insert

Notes to Figure 1: Shaded areas in Jharkhand inset are the three study districts – Gumla, Khunti and Ramgarh. Source: The India map and the inset map of Jharkhand were both sourced from https://d-maps.com.

Table 1: Treatment and control blocks in study districts

District	Treatment block	Control block
Gumla	Raidih/Gumla	Chainpur
Khunti	Torpa	Rania
Ramgarh	Gola	Ramgarh

Source: Authors' block selection exercise; see text for details.

Based on ex-ante power calculations with SHG data for Jharkhand, we selected 200 households in each block for a target sample of 1200 households, giving us the power to detect a change of 1.4 household assets, 0.2 acres of land cultivated, 1.2 activities in which the woman had input in decisionmaking, 1.6 activities where the woman had control over income and two hours in time spent working. In the treatment blocks, we used the PRADAN FPO member lists of women and their villages to select the sample. In the control blocks, we selected villages at random from the full list of villages equal to the minimum number of treatment block villages and distributed the overall target sample size equally across these villages.

FPOs may or may not have been set up in control blocks at the time of the baseline. For this reason, and since FPO members in treatment blocks were themselves drawn from within the SHG fold, our criterion for inclusion in the survey from a control block was SHG (and not FPO) membership. We selected women SHG members at random from a list of those eligible, identified through a partial household enumeration exercise. Control-block FPOs, if any, could be supported by a range of state and non-state (private) actors.

3.1.2 Quantitative data

We conducted our baseline survey in March-April 2022, and endline a year later in March-April 2023, interviewing two members of each household – the primary female respondent and their spouse or, if the spouse was not available, another male decisionmaker.

The primary female respondent was asked about their participation in collective organizations like SHGs and FPOs, the agricultural training and extension services they received, and adoption of mechanization. The primary male respondent was asked about household socioeconomic characteristics, including the ownership of consumption assets, agricultural implements, and other productive assets; shocks; income from non-agricultural wage and salary employment; and land ownership and use. We split modules between female and male respondents to keep each survey to 60-75 minutes. Both women and men were administered the pro-WEAI and the market inclusion (+MI) module which includes new indicators developed under ANEW, such as the respondent's access to information, participation in sales and negotiations and their access to productive capital via the collective. The full set of indicators under the pro-WEAI is in Appendix Table A.1. Finally, we conducted a short village-level community survey at baseline with knowledgeable members of the community.

3.2 Quantitative analysis

We compare the change from baseline to endline in our outcomes of interest among treated individuals to the change among a set of similar individuals in the control arm who did not receive these interventions. We implement this using difference-in-difference with nearest neighbor

matching (DiD-NNM)[5]. Treated and control individuals are matched to minimize the average differences in a set of individual and household characteristics, using a multidimensional metric to determine the weights for constructing the average. Once matched, the treatment effect is measured as the average difference in the change in outcomes for a treated individual compared to the change in outcomes for a control individual. Since we match on more than two continuous variables, we use the bias correction method proposed by (Abadie & Imbens, 2006).

We perform two sets of analyses to assess the robustness of our results. First, we check for common support, and re-estimate our results on the trimmed sample. To do this, we trim the sample unevenly on either side to achieve common support, as well as evenly on both sides using the rule of thumb of 0.1 as proposed in (Imbens, 2015). Second, we estimate difference-in-difference with inverse-probability weighted regressions, as a robustness check for the nearest neighbor matching approach. This method, also referred to as the propensity score weighting (Hirano et al., 2003), statistically balances a large set of pre-intervention characteristics across treatment and comparison groups. Propensity score weighting involves weighting each observation in the comparison group based on its predicted probability of being in the treatment group (or the estimated propensity score) whereas each observation in the treatment group gets a weight equal to one. The effect of the treatment is then estimated by running an ordinary least squares model on the weighted data. We do not have pre-baseline data and cannot check for the parallel trends assumption, so we do not interpret any of our results as causal.

3.2.1 Covariates

For our matching exercise, we use baseline levels of individual, household and village characteristics that can be argued to be pre-determined and not affected by the treatment itself, including age, schooling, employment status, caste and religion dummies, household demographics, and indicators for village infrastructure.

[5] This is operationalized using the *teffects nnm* command in STATA 18, which uses a weighted function of the covariates for matching. See here: https://www.stata.com/manuals/teteffectsnnmatch.pdf

3.2.2 Outcomes

Our primary outcomes are:

i. Household asset accumulation: measured using the total number of productive and non-productive assets owned by the household.[6]
ii. Average land cultivated across seasons for two main cropping seasons, rabi (winter) and kharif (monsoon).
iii. Men's and women's empowerment scores using pro-WEAI+MI: measured using the individual empowerment score, the number of activities for which the respondent has some input in production, number of activities where the respondent has input into income decisions, and the time spent working (in hours).

Our secondary outcomes are:

i. Per acre agricultural yields, revenues and costs of cultivation for the two main cropping seasons, rabi (winter) and kharif (monsoon).
ii. Cropping intensity, defined as the ratio of total cropped area to total sown area for two main cropping seasons, rabi (winter) and kharif (monsoon) separately.
iii. Other measures of women's and men's empowerment as measured by the pro-WEAI.
iv. Additional +MI indicators developed under the ANEW project, including access to information, participation in sales and negotiations, access to productive capital via the FPO.

We winsorize land cultivated, total production, revenues per acre, and costs per acre at (1, 99) to remove outliers. Ex-post power calculations conducted using the baseline data show that we are powered to detect changes of 2.5 household assets, 0.37-1.45 acres change in average land cultivated, 0.97 activities in which the woman had input in decisionmaking, 1.6 activities where the woman had control over income and 1.36 hours in time spent working.

[6] These measures of asset ownership are not taken from pro-WEAI but are drawn from a longer module on consumptive and productive assets.

3.3 Qualitative study design

The qualitative study was designed to complement and inform the quantitative evaluation and was conducted in largely the same districts and blocks.[7] Three research questions guided the qualitative work (see Appendix Table A.2):

i. How are gender dynamics changing within organizations (such as FPOs) and across different nodes in agricultural value chains?

ii. Does participation in collective organizations (FPOs) empower women both within the household and in the broader community?

iii. How has PRADAN's intervention affected FPOs' collective efficacy and influenced women's participation in such organizations?

3.3.1 Sample

In treatment sites, we interviewed women FPO members, their husbands who are also farmers, female supervisors or managers of the FPO, members of the FPO Board of Directors (BoDs), and PRADAN program staff. In control sites, we interviewed SHG members, their husbands who are also farmers, and leaders of the SHGs and their higher-level federations. In control sites, we first established contact with leaders and members of the cluster-level federation with the support of block-level functionaries of the state livelihoods mission, and then identified those who were willing to be interviewed. Other respondents (men and SHG women not in leadership positions) were identified and interviewed upon visiting these villages. Actors were sampled to achieve maximum variation in terms of village location and the nature of participation of the actors. For instance, in the treatment sites women farmer members were sampled to obtain a similar number of new members (one year or less) and long-term members (two years or more).

[7] The one exception was the control block in Ramgarh, where we were unable to establish a connection with an NGO partner. We replaced this block with Peterbar block in the neighboring district of Bokaro. While not in the same district, Peterbar is a close match to the treatment block, Gola, along the same ten indicators used to match blocks for the quantitative study.

3.3.2 Qualitative data

We administered tailored, open-ended discussion guides with suggested probes and prompts related to the research questions for semi-structured interviews (SSIs) and focus group discussions (FGDs) to key informants operating at different levels of the FPO system (Appendix Table A.3). SSI and FGD guides were piloted in Gumla district in August 2022 and revised accordingly. Data was collected between September 2022 to December 2022. All guides were written in English and administered in Hindi or another local language by the lead qualitative researcher.

3.4 Qualitative analysis

Recordings and notes from a total of 59 SSIs and 9 FGDs with 133 respondents (118 women and 15 men) were transcribed, translated into English, and entered into a data matrix, and thematic content analysis conducted. The first phase of data analysis entailed reviewing transcript texts and assigning descriptive codes, based on a codebook, to identify common areas of information (Saldaña, 2013). These common areas of information were further analyzed to identify themes and their variations that were pertinent to the research questions and sub-questions. Recurring themes were identified followed by the second phase of comparing and contrasting responses across respondent categories and treatment and control sites.

3.5 Ethical review and study registration

We obtained ethical clearance for both the quantitative and qualitative study components from the International Food Policy Research Institute's Institutional Review Board (IRB application number PHND-21-1139) and local ethical clearance from Sigma, New Delhi, India and from the Academy of Management Studies, Lucknow, Uttar Pradesh, India. This study was registered on the 3ie Registry for International Development Impact Evaluations (registry ID RIDIE-STUDY-ID-619b30f08db33). The analysis plan was followed as registered with some modifications to the set of covariates used for matching: the variables for husband, mother- and father-in-law living in the household, anyone in the

household having a bank account, an indicator for owning/renting/sharecropping land, and for the village having electricity in all areas were dropped because of low variation in our sample.

Standard protocols of anonymity and confidentiality were followed throughout the study. Wherever possible, respondents were interviewed in private with the right to discontinue the interview at any point or to refuse to answer specific questions. For both the quantitative survey and qualitative work, respondents provided informed oral consent to be interviewed, and, if relevant, recorded. Extensive field notes were taken in four cases where qualitative participants were not comfortable being recorded but were willing to participate in the interviews.

4 RESULTS

4.1 Sample characteristics

We see statistically significant differences by arm in the primary woman's years of schooling (higher in control, $p<0.10$) and employment status (higher in treatment, $p<0.01$), the primary man's employment status (higher in treatment, $p<0.05$), household size (higher in treatment, $p<0.10$), caste and religious composition (Table 2). *A priori,* it isn't clear how these differences will bias our results. Following (Imbens, 2015), we assess the overlap in the covariate distributions by estimating the normalized differences, which is the average covariate value by treatment status scaled by the standard deviation of the covariate. Small values of the normalized difference indicate considerable overlap in the distributions. As Table 2 shows, this normalized difference is less than 0.3 for all except three variables - employment status and dummies for belonging to Scheduled Tribe and Sarna ethnic groups.

We see considerable overlap between the propensity score kernel density distributions for treatment and comparison arms (Appendix Figure A.1). The same figure shows the two levels at which we trim our sample to re-estimate our results: trim 1 refers to the uneven trim that minimizes sample size loss while ensuring common support, while trim 2 uses the rule of thumb method to trim the sample by 0.1 at both ends.

At both baseline and endline, treatment households have more productive assets, more land cultivated, higher agricultural yields, considerably higher agricultural yields and revenues per acre, but comparable costs per acre and cropping intensities (defined as the ratio of gross cropped area to net sown area in a year) (Appendix Table A.4). Interestingly, men and women have very similar empowerment scores at both baseline and endline and across both arms.[8] For both men and women, the number of types of groups they are active members of declines from baseline to endline, especially among treatment arm households. Further investigations (not reported here) into the *types*

[8] These empowerment results are unusual in the Indian context, where women typically have considerably lower levels of absolute and relative empowerment, and likely reflect the non-representative programmatic context in both treatment and control blocks. For example, a five-state study including Jharkhand found about 66% of women and about 73% of men were empowered (Kumar et al., 2021)), compared to the roughly 73% among both men and women in our sample.

of groups women and men in treatment and control arms respond being active in does not support the hypothesis that FPO groups are crowding out other groups; in fact, membership in all types of groups falls for men in both arms between baseline and endline, as is broadly the case for women, where we see a decline in FPO membership from baseline to endline. The baseline survey was conducted during COVID, when respondents had limited mobility outside their villages and might possibly have joined more groups that they later left.

The fact that treatment arm households were already doing better than their control arm counterparts at baseline corroborates the qualitative work that showed that poor farmers are not always able to participate, as membership in FPO requires a certain amount of farmland, a source of irrigation and a bank account. One supervisor commented, *"Very poor farmers cannot take risks. They don't have so much capital to invest and it will be a problem if they face losses if productivity is lower than expected. So, we don't force them to join the producer group."* (Treatment arm, Gola, FPO supervisor).

Table 2: Balance in baseline characteristics by treatment arm

	Treatment (n=612)	Control (n=609)	p-value	Normalized difference
Primary female respondent				
Age	42.35 (11.53)	41.07 (11.92)	0.058	-0.109
Years of schooling	4.37 (4.72)	5.14 (5.02)	0.006	0.159
Employed (=1)	92.95 (25.62)	74.84 (43.43)	<0.001	-0.508
Married (=1)	91.34 (28.15)	93.60 (24.50)	0.136	0.086
Primary male respondent				
Age	44.39 (13.45)	43.49 (14.10)	0.249	-0.066
Years of schooling	7.02 (4.66)	7.42 (4.55)	0.137	0.086
Employed (=1)	95.58 (20.57)	92.12 (26.97)	0.012	-0.144
Household				
Household size	5.69 (2.19)	5.40 (2.09)	0.016	-0.138
Scheduled Caste (SC) (=1)	6.05 (23.85)	11.00 (31.32)	0.002	0.178
Scheduled Tribe (ST) (=1)	55.23 (49.77)	38.92 (48.80)	<0.001	-0.331
Other Backward Caste (OBC) (=1)	36.76 (48.26)	45.81 (49.87)	0.001	0.184
Hindu (=1)	48.86 (50.03)	58.62 (49.29)	<0.001	0.197
Muslim (=1)	0.16 (4.04)	3.12 (17.40)	<0.001	0.234
Christian (=1)	25.33 (43.52)	25.29 (43.50)	0.987	-0.001
Sarna (=1)	25.65 (43.71)	12.97 (33.63)	<0.001	-0.325
Ratio of male to female in HH	1.30 (0.88)	1.35 (0.93)	0.348	0.054
Dependency ratio	0.62 (0.62)	0.61 (0.58)	0.848	-0.011
Total males in the HH more than 18 years	1.87 (0.94)	1.83 (0.91)	0.396	-0.049
Number of children under 5	0.30 (0.60)	0.39 (0.72)	0.018	0.136
Wealth score	-0.64 (8.74)	0.64 (2.29)	<0.001	0.200
Village				
At least one government primary school (=1)	95.92 (19.81)	95.89 (19.86)	0.986	-0.001
At least one private primary school (=1)	35.46 (47.88)	36.95 (48.31)	0.589	0.031
At least one Anganwadi centre (=1)	100.00 (0)	95.89 (19.86)	<0.001	-0.292
Distance to nearest town (in KM)	12.41 (5.98)	12.56 (8.93)	0.713	0.021

Source: Authors' calculations. *p<0.10, **p<0.05, ***p<0.01. The dependency ratio is defined as (number of HH members aged (0-14) + P number of HH members aged (65+) / number of HH members aged (15-64). The normalized difference is the average value of the covariate by treatment status scaled by the standard deviation, following (Imbens, 2015).

4.2 Attrition

We interviewed 1222 primary women and men at baseline from as many households and re-interviewed 1164 women and 1068 men at endline. When the woman respondent was not available, the household was dropped. When the man respondent was not available, we replaced him with another decisionmaking male adult household member. Thus, we have three types of attrition:

1. Household not available at endline
2. Household available, primary woman available, no primary man available
3. Household available, primary woman available, primary man available but not the same as baseline

We check for differential attrition by treatment status for all three scenarios listed above (Appendix Table A.5; Table A.6; Table A.7). Differential attrition is the starkest in the third scenario, where the baseline male respondent is replaced by another male household member. Male respondents who attrit are, on average, younger, better educated, less likely to be employed at baseline and come from larger households, all characteristics that we might expect to be positively associated with, for example, migration for labor work.

Figure A.2 presents the inverse attrition weights derived from the probit models for each of the three scenarios. The attrition weights are generally tightly distributed around 1, though less so in attrition scenarios 2 and 3, suggesting that integrating attrition weights into our analysis would result in only minor adjustments to our estimates.[9] We control for these covariates in our estimations to account for any remaining biases.

[9] We use the *teffects* command in Stata (on the transformed change outcome variables). This command does not permit the use of attrition weights, so we are not able to formally correct for these in our analysis.

4.3 Impacts on primary outcomes

Table 3 presents the DID-NNM estimates for our primary outcomes, each expressed as the change in the outcome from baseline to endline. The point estimate on the number of productive assets is negative but not significant; though we recall from Table 2 that households in the treatment arm had more productive assets on average at baseline. Indeed, this finding is somewhat at odds with qualitative interviews, where husbands of FPO members report using their increased household income to purchase valuable productive assets like motorcycles and water pumps. We also don't see any effect of the treatment on average land cultivated, which could be a result of lack of power, though it is likely that the one-year timespan was simply too short to realize any impacts on this.

In terms of the empowerment outcomes, we see a statistically significant reduction in men's overall empowerment scores, on the number of activities in which they have input or feel they can make decisions, and on the number of activities where they have control over income, suggesting an unintended negative consequence of the intervention on men. We also see a statistically significant increase in the number of hours both women and men work, indicative of an additional time burden.

Table 3: DID-NNM impact estimates for primary outcomes

Primary Outcome	Treatment (PRADAN FPOs) vs Control (non-PRADAN SHGs)
Panel I: Primary outcomes, agriculture	
HH non-productive asset count	-0.31 (0.33)
HH productive asset count	-0.18 (0.23)
HH average land cultivated (in acre), rabi season	-0.01 (0.03)
HH average land cultivated (in acre), kharif season	0.04 (0.13)
Panel II: Primary outcomes, empowerment	
Individual empowerment score: women	-0.02 (0.02)
Individual empowerment score: men	-0.04* (0.02)
Women	
No of activities for which respondent has some input or feels can make decisions	-0.14 (0.15)
No of activities respondent has input in decisions on income and output from all activities participated in	0.09 (0.13)
No of hours respondent worked (both paid and unpaid work)	0.86*** (0.30)
Men	
No of activities for which respondent has some input or feels can make decisions	-0.64*** (0.16)
No of activities respondent has input in decisions on income and output from all activities participated in	-0.62*** (0.17)
No of hours respondent worked (both paid and unpaid work)	0.96*** (0.32)

Source: Authors' calculations. Robust standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01.

The negative impacts on men's control over income resonate with our qualitative findings. Women said that decisions around what and where to spend are still mostly made by men since *"men know better"* but acknowledge that there has been an improvement in their access to and control over income since joining women's collectives. Bank payments through the FPOs have been instrumental in increasing women's control over money. As an FPO member from Torpa remarked, *"[Earlier] when we went to the market to sell our crops, we used to get cash which didn't last very long, either taken by children or husband or spent by me. Also, because the amount used to be small it got spent. Now we sell more so we receive more. That is why it is good that now our money is in the bank, we can save, and I can decide to take that out only when there is a need."* Another FPO member from Gumla agreed, *"When my husband goes to the market to sell, he also spends on food and alcohol. He does not buy clothes for*

children or other household things. But now it is different. The money comes into my account, and it does not get spent on small unimportant things. I try to save it as long as I can."

Though women across the treatment and control sites said that household decisions have always been taken "together" with their spouse, they use a range of terms to explain joint household decision-making: "asking", "consulting", "informing", and "convincing", with "asking" exhibiting the lowest level of bargaining power and "convincing" the highest. Women in both treatment and control arms reported an increase in their participation in decisionmaking since they became SHG members; they perceive themselves as better informed, and, encouragingly, report that men recognize women's access to information and encourage their participation as well. Women consider FPOs as the next step to improving their ability to negotiate by enhancing their farming capacity and income. Membership and participation in the FPO gives them the confidence to assert themselves. As one woman in Gumla put it, *"Since I have started growing vegetables and selling them through the FPO, I see the benefit of doing so and I initiate discussions about growing vegetables in a larger patch of land in my home. Then I convinced my husband. Earlier if he was not sure and didn't initiate a new practice, I was also not sure."*

The qualitative work also provided insights into men's and women's time use and their workload. Women's collectives were linked in various ways to changing workload, and though women FPO members reported participating in other agricultural activities in the time freed up by not having to sell their produce, they did not seem to mind, with one FPO member from Gola saying, *"Even though I give more time to my crops now, I feel relaxed because I don't have to keep travelling to the market and spend the whole day selling crops."* Time is frequently mentioned as a key constraint to being more involved in trainings and other activities, but despite the increased labor burden some women may be able to allocate their efforts to preferred activities. In turn, men in the treatment areas pointed to their wives' increased participation in SHG and FPO meetings as evidence that women were *"not giving enough attention to the home"*. As the husband of a new FPO member in Gola said, "*Since being engaged in FPO work she is not able to give so much time on the farm and I have to do it alone. She keeps attending these [FPO]*

meetings. Then there are SHG meetings. For example, today I had to crush the urad (black gram) all alone in the morning."

We examine intra-household task distribution for men and women (Appendix Table A.8). We categorize activities into self-care (including leisure), unpaid domestic work (including care work), non-agricultural activities (self-employment and wage work), and agricultural activities (including FPO meetings). Both men and women in treatment arm households spend less time on domestic work than their counterparts in the control arm, more time on agricultural activities but significantly less on non-agricultural activities. This might reflect that control arm households are poorer and hence diversify their income sources; or that there is increased agricultural activity among treatment arm households thanks to their FPO membership.

4.4 Impacts on key secondary outcomes

Table 4 presents the DiD-NNM estimates for our secondary outcomes. We don't find any significant results on average per acre household yields, revenues or costs of cultivation in either season, or on cropping intensity. It is possible that the null results are due to the short time span of the evaluation and that we might see impacts on yields over a longer period.

Unpacking the empowerment results further reveals interesting patterns. For women, we see statistically significant and positive effects of the treatment on the number of instances in which they reject IPV against women and on the total number of assets that they solely or jointly own, and a statistically significant decline in the number of types of groups the respondent is part of. For men, we see a negative effect of the treatment on the number of assets solely or jointly owned that is almost equal in magnitude to the positive point estimate on this indicator for women, and a decline also in the number of types of groups they are active members of.

Finally, we look at three of the +MI indicators developed under ANEW, relating to access to information, participation in sales and negotiations and access to productive capital via the FPO or

cooperative.[10] Surprisingly, the impact estimates in Table 4 show a negative and statistically significant association with access to information for both women and men. One explanation is that they are now more aware of the types of information they do *not* receive. We see a positive association with access to productive capital via the FPO for women and negative for men, and a negative association with participation in sales negotiations for men alone.

Overall, though, effects of the treatment on empowerment outcomes are somewhat limited, which might seem surprising given the way the FPO intervention was framed. The qualitative work, however, highlights that it is the SHGs are the primary channel for empowerment, not FPOs. Both men and women in treatment and control sites perceived SHG membership as transformational. One SHG leader in Rania, a control site, articulated it thus, *"Since joining this SHG work, I have seen a lot of change in myself – I understand the importance of savings, education, and getting the right information. We receive support from the SHGs so we know we can expand our livelihoods. I can also see the change in myself more clearly because I see women who are not jagruk (aware) and backward."* FPO members do not (yet) see the FPO as a pathway to empowerment, despite these collectives being positioned as enhancing women's empowerment. By design, almost all the women in our sample are SHG members,[11] which might explain why we don't see large differences in empowerment between women in treatment and control households.

[10] Other measures of empowerment, while implemented and validated using data from these surveys, were not relevant to the intervention PRADAN designed and so were not included in the analysis. These include, for example, measures of the empowerment environment, that investigates safe and healthy work environments, freedom from sexual harassment in the workplace, among others.

[11] This should, of course, have been *all* women, but some might have dropped out of SHGs recently, or not consider themselves active members.

Table 4: DID-NNM impact estimates for secondary outcomes

Secondary Outcomes	Treatment (PRADAN FPOs) vs Control (non-PRADAN SHGs)
Panel I: Secondary outcomes, agriculture	
HH average yield (in kg/acre), rabi season	-220.78 (350.90)
HH average yield (in kg/acre), kharif season	14.13 (219.48)
HH average agricultural revenue (in INR/acre), rabi season	-2,365.25 (3,020.39)
HH average agricultural revenue (in INR/acre), kharif season	-228.73 (1,499.11)
HH average cost of cultivation (in INR/acre), rabi season	-974.56 (3,140.53)
HH average cost of cultivation (in INR/acre), kharif season	802.94 (1,810.30)
HH average cropping intensity, rabi season$^{\alpha}$	-9.71 (9.98)
HH average cropping intensity, kharif season$^{\alpha}$	-0.87 (4.54)
Panel II: Secondary outcomes, pro-WEAI (Women)	
Intrinsic agency	
Autonomy in income$^{\beta}$	0.19 (0.16)
Self-efficacy$^{\delta}$	0.08 (0.11)
No of scenarios where respondent disagrees with IPV against women	0.23*** (0.07)
Instrumental agency	
Total assets that are solely/jointly owned by respondent	0.42** (0.18)
No of types of sources where respondent solely/jointly participated in credit decisions	0.14 (0.09)
No of places respondent visited when required	0.21 (0.21)
Collective agency	
No of types of groups respondent is an active member	-0.28*** (0.07)
Additional +MI indicators	
No. of activities where respondent participated and received high-quality information, advice, or training	-0.27** (0.12)
No of products or services in which respondent participated in sales and negotiated for the household	0.06 (0.12)
No. of productive assets accessed solely or jointly by the respondent from FPO/co-op	0.27*** (0.05)
Panel III: Secondary outcomes, pro-WEAI (Men)	
Intrinsic agency	
Autonomy in income$^{\beta}$	-0.23 (0.15)
Self-efficacy$^{\delta}$	0.01 (0.13)
No of scenarios where respondent disagrees with IPV against women	-0.13 (0.09)
Instrumental agency	
Total assets that are solely/jointly owned by respondent	-0.38* (0.22)
No of types of sources where respondent solely/jointly participated in credit decisions	-0.12 (0.09)

Secondary Outcomes	Treatment (PRADAN FPOs) vs Control (non-PRADAN SHGs)
No of places respondent visited when required	0.18 (0.23)
Collective agency	
No of types of groups respondent is an active member	-0.32*** (0.08)
Additional +MI indicators	
No. of activities where respondent participated and received high-quality information, advice, or training	-0.29*** (0.11)
No of products or services in which respondent participated in sales and negotiated for the household	-0.24** (0.11)
No. of productive assets accessed solely or jointly by the respondent from FPO/co-op	0.00 (0.06)

Source: Authors' calculations. Robust standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01. Rabi (winter) and kharif (monsoon) are the two main cropping seasons. α: Cropping intensity is defined as a ratio of gross cropped area to net sown area in a year. β: Autonomy in income is defined as a Relative Autonomy Index score that indicates being motivated by one's own values rather than coercion or fear of others' disapproval. δ: Self-efficacy is defined as "agree" or higher on average with a set of four self-efficacy questions.

4.5 Robustness

We perform two robustness checks as described in section 3.2: first, we re-estimate the DiD-NNM on a trimmed sample, and second, we use inverse-probability weighted regressions. Table A. 9 presents the balance in covariates (including normalized differences) for both ways of trimming the sample; we see that the balance across covariates improves substantially over Table 2, with a normalized difference of less than 0.3 in each case. Table A.10 and Table A.11 present the original estimates along with the robustness checks for comparison. The results for both primary and secondary outcomes are very similar across models, except for the overall individual empowerment scores for women and men, where the DiD-IPW results contrast with those of the other three models. This suggests that our results are fairly robust.

4.6 Heterogeneity by duration of FPO membership

Previous research suggests that the impacts of FPO membership accrue gradually over time (Desai & Joshi, 2014). Our qualitative work also indicated considerable differences in the experiences of long-term versus newer FPO members. Some newer members had not yet sold their produce through the FPO, so did not have access to lumpsum sale revenues and perceived their costs to be equal to their revenues.

Their husbands were uncertain of the benefits of joining the FPO and were reluctant to support their wife's participation in FPO activities. In contrast, long-term members were in a better position to control agricultural decision-making and to choose the best option available to them. For instance, while most long-term farmers sold their produce through the FPO, some long-term farmers in Gola chose instead to sell their produce in the local markets in expectation of better prices. Given these insights from our qualitative research, we test for heterogeneities in impact by length of FPO membership by splitting our treated sample roughly evenly at 1.5 years of FPO membership and re-estimating our models on the subsamples.

Duration of FPO membership is almost certainly endogenous, so we interpret our results as simply being indicative of how benefits to FPO membership might accrue more to some members than others. Table A.12 shows that the two groups are very well balanced on observable characteristics at baseline. In terms of the DiD-NNM models in Table 5, the reduction in the men's empowerment score is only significant when comparing the control arm with men in households where women have been FPO members for more than 1.5 years. The reduction in cost of cultivation per acre in both seasons is greater (though not statistically significant) in households where the woman has been an FPO member for more than 1.5 years, though we see mixed results for average agricultural revenues per acre by FPO membership tenure. Results on measures of women's asset ownership, mobility and rejection of IPV are all stronger for longer-term member households. Interestingly, for men, the negative results on aspects of instrumental agency we noted in Table 4 – reductions in their decisionmaking, asset ownership, control over income and in the number of hours worked – all seem to come from men in households where women have been members for less than 1.5 years, while the reduction in the number of scenarios where the man disagrees with IPV against women is concentrated among men in households with longer-term FPO women. This suggests that the shorter-term impacts of women's FPO membership might be the (real or perceived) transfer of decisionmaking and control over resources to women, while other impacts appear over time. This raises the possibility of backlash or resentment within the household early on in

FPO membership. Indeed, in our qualitative work, many women express concern that an increase in their individual ownership of assets may hamper family harmony.

Table 5: DID-NNM impact estimates for heterogeneity analysis based on membership duration

	FPO membership <1.5 years vs control	FPO membership >1.5 years vs control
Panel I: primary outcomes		
HH non-productive asset count	-0.21 (0.42)	-0.53 (0.36)
HH productive asset count	0.02 (0.29)	-0.37 (0.27)
HH average land cultivated (in acre), rabi season	-0.01 (0.05)	-0.00 (0.04)
HH average land cultivated (in acre), kharif season	0.03 (0.13)	0.05 (0.14)
Individual empowerment score: men	-0.04 (0.03)	-0.06** (0.03)
Individual empowerment score: women	-0.05* (0.03)	-0.01 (0.03)
Panel II: secondary outcomes: agriculture		
HH average yield (in kg/acre), rabi season	9.25 (401.09)	-369.92 (420.70)
HH average yield (in kg/acre), kharif season	-21.48 (290.51)	-37.95 (255.18)
HH average agricultural revenue (in INR/acre), rabi season	2,155.77 (3,590.26)	-6,076.82 (3,862.98)
HH average agricultural revenue (in INR/acre), kharif season	-1,183.51 (1,768.16)	1,463.37 (2,051.60)
HH average cost of cultivation (in INR/acre), rabi season	-1,121.22 (3,655.27)	-1,620.56 (3,425.44)
HH average cost of cultivation (in INR/acre), kharif season	1,917.43 (2,098.93)	-993.75 (2,563.50)
HH average cropping intensity, rabi season$^{\alpha}$	0.55 (11.99)	-24.14** (11.26)
HH average cropping intensity, kharif season$^{\alpha}$	-3.41 (5.17)	1.45 (5.40)
Panel III: secondary outcomes: pro-WEAI (women)		
Intrinsic agency		
Autonomy in income$^{\beta}$	0.27 (0.20)	0.13 (0.19)
Self-efficacy$^{\delta}$	-0.01 (0.13)	0.20 (0.14)
No of scenarios where respondent disagrees with IPV against women	0.14* (0.08)	0.27*** (0.09)
Instrumental agency		
No of activities for which respondent has some input or feels can make decisions	-0.09 (0.18)	-0.18 (0.17)
Total assets that are solely/jointly owned by respondent	0.30 (0.21)	0.37* (0.21)
No of types of sources where respondent solely/jointly participated in credit decisions	0.18* (0.11)	0.03 (0.11)
No of activities respondent has input in decisions on income and output from all activities participated in	-0.06 (0.16)	0.10 (0.15)
No of hours respondent worked	1.03*** (0.35)	0.35 (0.36)
No of places respondent visited when required	0.00 (0.22)	0.48* (0.25)
Collective agency		

	FPO membership <1.5 years vs control	FPO membership >1.5 years vs control
No of types of groups respondent is an active member in	-0.29*** (0.09)	-0.21** (0.09)
Additional +MI indicators		
No. of activities where respondent participated and received high-quality information, advice, or training	-0.14 (0.15)	-0.32** (0.16)
No of products or services in which respondent participated in sales and negotiated for the household	0.08 (0.15)	0.08 (0.15)
No. of productive assets accessed solely or jointly by the respondent from FPO/co-op	0.37*** (0.07)	0.21*** (0.08)
Panel IV: secondary outcomes: pro-WEAI (men)		
Intrinsic agency		
Autonomy in income$^{\beta}$	-0.06 (0.19)	-0.53*** (0.18)
Self-efficacy$^{\delta}$	-0.05 (0.15)	0.03 (0.15)
No of scenarios where respondent disagrees with IPV against women	-0.08 (0.11)	-0.18* (0.11)
Instrumental agency		
No of activities for which respondent has some input or feels can make decisions	-1.06*** (0.20)	-0.20 (0.20)
Total assets that are solely/jointly owned by respondent	-0.61** (0.27)	-0.18 (0.25)
No of types of sources where respondent solely/jointly participated in credit decisions	-0.05 (0.11)	-0.17 (0.11)
No of activities respondent has input in decisions on income and output from all activities participated in	-0.86*** (0.21)	-0.27 (0.19)
No of hours respondent worked	1.48*** (0.39)	0.28 (0.36)
No of places respondent visited when required	0.20 (0.28)	0.13 (0.28)
Collective agency		
No of types of groups respondent is an active member	-0.10 (0.10)	-0.47*** (0.10)
Additional +MI indicators		
No. of activities where respondent participated and received high-quality information, advice, or training	-0.11 (0.13)	-0.41*** (0.13)
No of products or services in which respondent participated in sales and negotiated for the household	-0.54*** (0.14)	-0.06 (0.14)
No. of productive assets accessed solely or jointly by the respondent from FPO/co-op	0.16** (0.08)	-0.13 (0.09)

Source: Authors' calculations. All comparison means are calculated at endline. Robust standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01. Rabi (winter) and kharif (monsoon) are the two main cropping seasons. α: Cropping intensity is defined as a ratio of gross cropped area to net sown area in a year. β: Autonomy in income is defined as a Relative Autonomy Index score that indicates being motivated by one's own values rather than coercion or fear of others' disapproval. δ: Self-efficacy is defined as "agree" or higher on average with a set of four self-efficacy questions.

5 POLICY IMPLICATIONS

We conduct a mixed methods evaluation of agriculture and gender-based interventions delivered to smallholder farmers in Jharkhand, India, using two waves of panel data one year apart, as well as an in-depth qualitative study. We do not find significant quantitative impacts on our key primary outcomes – asset ownership, land cultivated and overall empowerment scores for men and women – except for a negative impact on men's empowerment scores. Interestingly, unpacking the empowerment outcomes shows that men in households where women are members seem to be doing worse off on decisionmaking, ownership of assets, control over income, participation in sales negotiations and in access to productive capital through a cooperative than their counterparts in the control arm. At least in the short term, the FPOs appear to be transferring decisionmaking power and resource control away from the men. The qualitative findings support most of these results and point to the duration of FPO membership as being an important factor in determining benefits. We investigate this heterogeneity quantitatively and find that while the results for agricultural outcomes are insignificant regardless of duration of membership, it is the shorter-term FPO member households where the bulk of the negative impacts on men's empowerment measures is visible. It seems that men in households where women have recently become members keenly feel the loss of control over income and decisionmaking, even as women continue to acknowledge that men know better and take most of the decisions.

Our qualitative findings offer further insight into the benefits of membership in FPOs. FPOs provide welcome support both for input purchases and sales of agricultural produce, thereby saving women time and effort. Households report receiving good quality inputs from the FPOs. More importantly, FPOs allow women to avoid the potentially unpleasant and time-consuming business of negotiating directly with vendors whom they did not trust and are able to use their freed-up time to engage in activities of their choice.

Overall, the qualitative findings suggest that FPOs provide an enabling platform for women farmers, reducing their transactions costs and improving their access to information and resources.

However, the extent to which they act as platforms to enhance women's empowerment is unclear. Most women pointed to their membership in SHGs, not FPOs, as being truly transformational, giving them the self-confidence and awareness to manage their own affairs.

It is important to acknowledge the limitations of our study. Like much of the literature on FPOs, it was difficult to establish causality and design a rigorous quantitative analysis. The FPOs in our setting were not randomly assigned, this is by design, as the success of an FPO depends on certain preconditions. This introduces placement bias that is hard to correct for. Not only that, the FPOs were also already operational at the time of our baseline study, and the implementing NGO had been working to set up and strengthen their internal processes and to introduce the agriculture-related interventions, though these were at a nascent stage. Unfortunately, these two factors work in opposite directions; the placement bias would serve to bias our estimates upward (more favorably), while the late baseline would do the opposite. In addition, the baseline survey was conducted just after the third wave of COVID, in early 2022. Though both treatment and control arm households would have faced the same shock, it could have affected them differentially. For example, treatment arm households that had begun early adoption of horticultural crops during COVID were disproportionately affected by pandemic-induced supply chain disruptions. The previous year's harvest of watermelon, one of the winner crops promoted by the FPOs, was in the middle of the devastating second wave of COVID-19 and many households reported leaving the fruit to rot in the field. Lastly, the period between baseline and endline was too short to identify any but the most short-term effects of the interventions. For example, it can take several cycles for farmers to adopt (and perfect) new agricultural practices. Future longer-duration studies of FPOs could inform the important question of the sustainability of some of the effects we report here.

The Indian government has made a strong push to scale up the institution of FPOs to improve smallholder farmer incomes. Given the relatively recent spurt in the number of FPOs and the variation across FPOs in supporting organization type, policies, size and scope, the evidence on what works to improve agricultural outcomes for smallholder farmers in India is still growing. Evidence of the social

impacts of these collectives in the Indian context remains weak. So, what do our findings imply for the design of policies to support FPOs and of the interventions delivered through them?

First, although specific approaches need to be refined, FPOs appear to have the potential to improve the empowerment of smallholder women farmers in India. Importantly, they may improve access to services and resources, and help members exercise agency over the allocation of their time. However, the move towards horticultural crops and the adoption of improved agricultural practices (as promoted in the interventions studied here) necessarily requires time to show results. Given our heterogeneity analysis that suggests some FPO benefits take time to accrue, it may be worth providing incentives to women as the first start participating in FPOs, such as subsidizing the cost of inputs for an initial period or allowing for payments in instalments rather than as a lumpsum. Doing so would also pave the way for more inclusive FPO membership by reducing entry barriers for poor households.

Second, our findings raise the possibility of disempowering men, and reducing their control over income and decisionmaking. These results are based on men's own self-reports, but even if FPOs create the perception of transferring resources and decisionmaking from men to women, there is a possibility of backlash that needs to be accounted for by supporting organizations. This is particularly notable in a context where many men are from marginalized ethnic groups and may also be disempowered due to caste and tribe dynamics. It may be strategic to take a multipronged approach that integrates men in a way that allows them to generate some benefits from and take ownership over the program; while ensuring they are sensitized to gender issues and that women aren't made to cede space. Gauging the correct sequence of interventions is also key here: if the economic benefits of FPOs are apparent early on, it might reduce men's objections to women's participation. However, changing social norms takes time, so gender interventions should not be treated as an afterthought either.

Third, digital payments by the FPO were critical to helping women maintain control over their income. This may apply in other domains as well. Increasing access might involve decreasing constraints to owning and accessing digital accounts, such as *bank mitras* (frontline workers) assisting with the necessary documentation.

Fourth, participating in collectives is time intensive. We need to assess the feasibility and practicality of expecting women to participate in multiple groups simultaneously; doing so requires us to understand the other constraints on women, the potential trade-offs involved in such multi-group involvement and the capacity of the collective in question to absorb interventions of different types. For example, if the SHG is transformational from an empowerment perspective while the FPO is viewed more as an economic entity, perhaps gender sensitization trainings are best targeted at the level of the SHG or its immediate federations.

In India, FPOs have emerged as a way to improve smallholder farmer outcomes, especially for women and other marginalized groups. Our results suggest that FPO-based interventions have potential, but that effects of interventions on agricultural and gender-related outcomes are modest and take time to manifest. FPO-based interventions that aim to empower women or other marginalized groups will require sustained investments over multiple years and will need to go beyond improving FPO functioning and increasing women's participation to improving their circumstances and ultimately, to truly transforming social and gender norms.

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A. APPENDIX

Appendix Figures

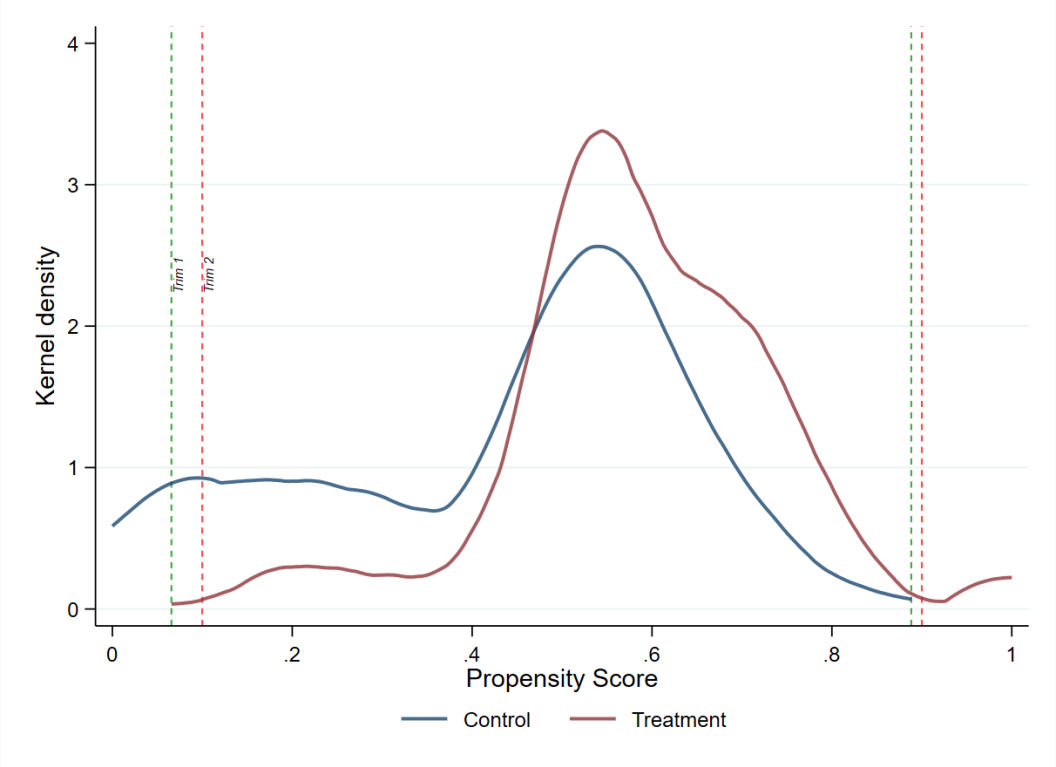

Figure A.1. Kernel density of propensity score across treatment and control arms

Notes: Propensity scores are calculated based on the methodology suggested by in Imbens (2015). Trim 1 corresponds to dropping all those observations where there is no common support (uneven trim on either side). Trim 2 corresponds to dropping observations where the propensity scores are either less than 0.1 or greater than 0.9, based on the rule of thumb provided in (Imbens, 2015).

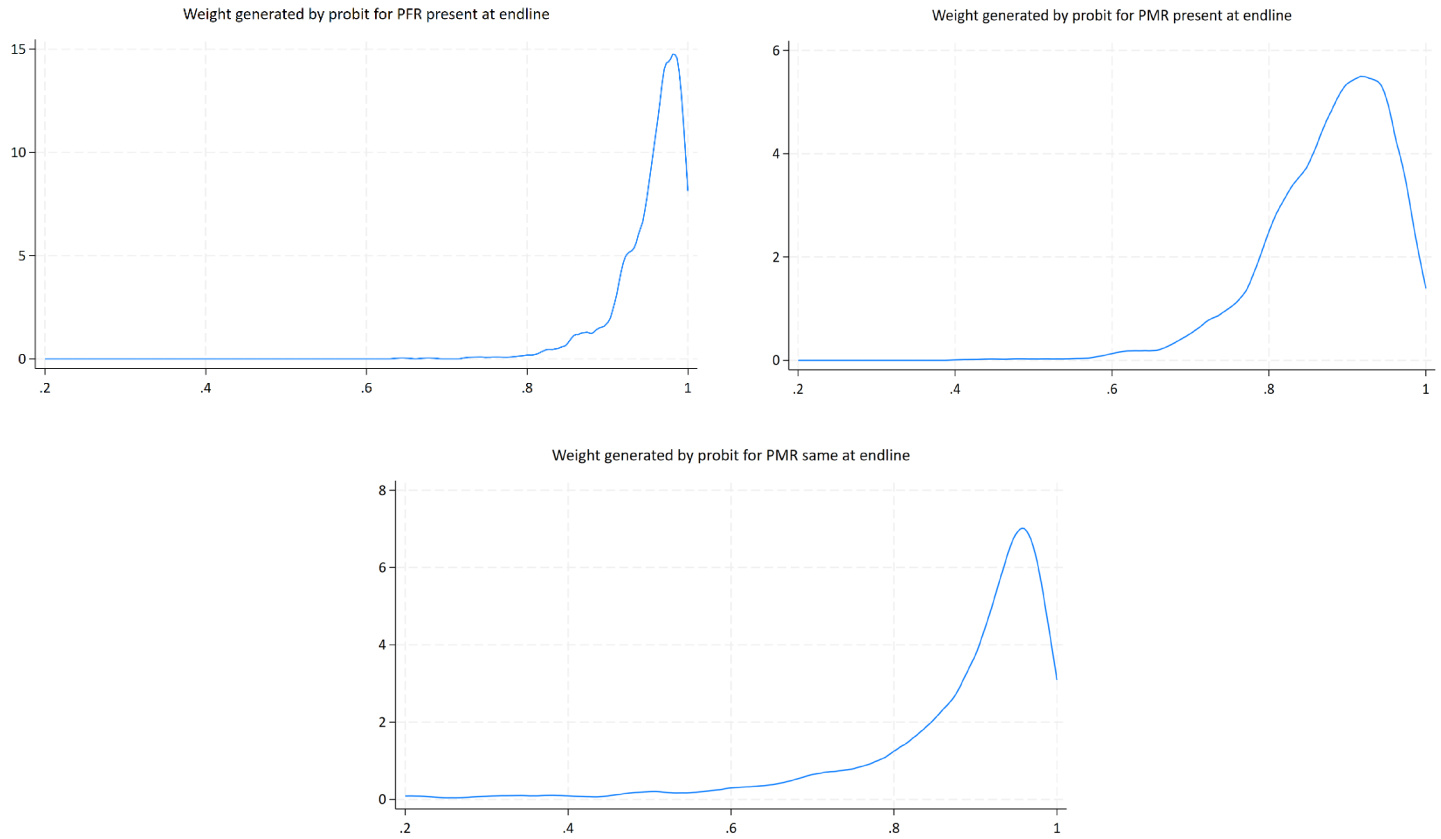

Figure A.2. Kernel densities of inverse attrition probabilities

Notes: PFR: primary female respondent, PMR: primary male respondent. PMR present at endline compares households where no primary male could be found at endline to households where a primary male could be found; PMR same at endline compares households where the primary male at endline is different from the primary male found at baseline.

Appendix tables

Table A.1. Description of pro-WEAI and +MI indicators used in this paper

Indicator	Level	Type	Definition
Aggregate indicators			
Empowerment score	Individual	Continuous	Proportion of indicators (out of 10) of empowerment respondent is adequate in
Count versions of core pro-WEAI indicators			
Intrinsic agency			
Autonomy in income	Individual	Count	Defined as a Relative Autonomy Index score that indicates being motivated by one's own values rather than coercion or fear of others' disapproval
Self-efficacy	Individual	Count	Score on the New General Self-Efficacy Scale (Chen et al., 2001); defined as "agree" or higher on average with a set of four self-efficacy questions.
No of scenarios where respondent disagrees with IPV against women	Individual	Count	Number of scenarios (out of 4) in which respondent believes husband is not justified in hitting or beating wife.
Instrumental agency			
No of activities for which respondent has some input or feels can make decisions	Individual	Count	Number of agricultural activities (out of 7) for which makes decision solely, makes decision jointly and has at least some in input in the decisions, or feels could make decision
Total assets that are solely/jointly owned by respondent	Individual	Count	Number of assets (out of 13) they own solely or jointly
No of types of sources where respondent solely/jointly participated in credit decisions	Individual	Count	Number of sources (out of 7) of credit they participated in decisions about
No of activities respondent has input in decisions on income and output from all activities participated in	Individual	Count	Number of activities (out of 7) for which has input in decisions related to income and outputs
No of hours respondent worked	Individual	Count	Number of hours spent (out of 24 hrs) on work
No of places respondent visited when required	Individual	Count	Number of locations (out of 10) respondent visits once per week (city, market, family/relative) or once per month (health facility, public meeting)
Collective agency			
No of types of groups respondent is an active member in	Individual	Count	Number of community groups (out of 9) they are an active member in (self-reported)
Additional +MI indicators developed under ANEW			
No. of activities where respondent participated and received high-quality information, advice, or training	Individual	Count	Number of activities (out of 8) in which respondent participated and received high-quality information, advice, or training
No of products or services in which respondent participated in sales and negotiated for the household	Individual	Count	Number of products or services (out of 10) from livelihood activities in which respondent participated in sales and negotiated for the household
No. of productive assets accessed solely or jointly by the respondent from FPO/co-op	Individual	Count	Number of assets (out of 5) which are considered productive is accessed solely or jointly from the FPO/co-operative

Source: (Malapit et al., 2019, 2023) and authors' own definitions. Notes: pro-WEAI: project-level women's empowerment in agriculture index; +MI: additional market inclusion indicators; ANEW: Applying New Evidence for Women's empowerment.

Table A.2. Primary and secondary research questions for the qualitative study

Overarching research questions	Secondary questions	Treatment sites	Control sites
		Producer Group (FPOs) farmers, Husbands, PG supervisors, Board of Directors (BoDs), Implementors [W=Women; M=Men]	SHG members/ Farmers, Husbands, SHG leaders
1: How are gender dynamics changing in FPOs at and between different nodes in agricultural value chains	● What is the effect of local social and gender norms and beliefs on women's and men's participation in the agricultural value chains? How has this changed over time?	FPO farmers (W), Husbands (M)	SHG members (W), Husbands (M) SHG leaders (W)
	● What are the key barriers and facilitators related to women's and men's full and equal participation in the formal market systems?	FPO farmers (W), Husbands	SHG members (W), Husbands (M)
	● What solutions/conditions do women and men perceive as most helpful to them in expanding their participation in the agricultural value chains?	FPO farmers (W), Husbands (M)	SHG members (W), Husbands (M)
2: Does participation in collective organizations (FPOs) empower women inside and outside the household	● What are the emic perspectives of empowerment and men's and women's ability to make independent decisions? Shifts in perspectives.	FPO farmers (W), Husbands (M) FPO Supervisors (W)	SHG members (W), Husbands (M) SHG leaders (W)
	● How have strategies and activities in the LEAP project provided opportunities for women to exercise autonomy in production and post-harvest activities, and access to innovation, infrastructure, formal market systems and financial services?	FPO farmers (W), Husbands, PG supervisors (W/M), BoDs (W), Implementors	
	● How do women and men participants perceive the benefits of the PRADAN intervention?	FPO farmers (W), Husbands (M)	
	● How have the intra-household dynamics, women's bargaining power, control over the use of income changed over time? Why?	FPO farmers (W), Husbands (M) FPO Supervisors (W/M)	SHG members (W), Husbands (M) SHG leaders (W)
3: How has PRADAN's intervention affected FPOs' collective efficacy and influence women's	● How did the project lead to changes in FPO functioning and in the group's social capital and collective efficacy?	FPO farmers (W), Husbands (M), FPO Supervisors (W/M) BoDs (W)	

Overarching research questions	Secondary questions	Treatment sites	Control sites
		Producer Group (FPOs) farmers, Husbands, PG supervisors, Board of Directors (BoDs), Implementors [W=Women; M=Men]	SHG members/ Farmers, Husbands, SHG leaders
participation in such organizations?		Implementors (M/W)	
	● In what ways have marginalized and vulnerable been included in the FPOs and received enough support to grow?	FPO farmers (W), Husbands (M), FPO Supervisors (W/M) BoDs (W) Implementors (M/W)	
	● How has having women FPO leaders changed outcomes for FPOs?	FPO Supervisors (W/M) BoDs (W) Implementors (M/W)	
	● What is the current FPO leaders' confidence in FPO management and in building the capacities of other women?	BoDs (W) Implementors (M/W)	
	● What are the barriers and facilitators to PRADAN's approach to implementation that only target women? How has it affected men's perception towards the intervention?	FPO farmers (W), Husbands (M), FPO supervisors (W/M), BoDs (W), Implementors (M/W)	
	● What are the challenges anticipated by PRADAN on the sustainability of the project? What are the ways to overcome/prevent these anticipated challenges?	Implementors (M/W)	

Table A.3. Overview of the qualitative methods

Type of site	Method used	Category of respondents	Number of respondents	Respondent gender
Treatment Block 1: Gumla Block 2: Torpa Block 3: Gola	Semi-structured Interviews (SSIs) (n=42)	Farmer Members (6 from each location: 3 new members ≥ 1 years; 3 old members (≥2 years)	18	Women
		Member Husbands	6	Men
		Supervisors/managers	6	5 Women; 1 Man
		Board of Directors	6	Women
		NGO Implementors	6	1 Woman; 5 Men
	Focus Group Discussions (FGDs) (n=6)	Farmer members	25	Women
		Board of Directors	22	Women
Control Block 1: Chainpur Block 2: Rania Block 3: Peterbar	SSIs (n=17)	Women farmers	9	Women
		Farmer Husband	3	Men
		SHG/VO/CLF leaders	5	Women
	FGDs (n=3)	Women farmers	27	Women
TOTAL **59 SSIs and 9 FGDs**			**133**	**118 Women; 15 Men**

Table A.4. Baseline and endline values of key primary and secondary outcomes

	Baseline				Endline			
	N	Treatment	Control	Difference in means	N	Treatment	Control	Difference in means
Panel I: primary outcomes								
HH non-productive asset count	1218	12.20 (3.53)	12.22 (4.04)	-0.03	1068	12.51 (3.66)	12.88 (3.76)	-0.37
HH productive asset count	1218	7.76 (2.30)	6.70 (2.47)	1.06***	1068	8.22 (2.30)	7.29 (2.53)	0.93***
HH average land cultivated (in acre), rabi season	732	0.46 (0.51)	0.29 (0.38)	0.17***	762	0.44 (0.49)	0.25 (0.36)	0.19***
HH average land cultivated (in acre), kharif season	1132	1.60 (1.61)	1.41 (1.59)	0.19	997	1.53 (1.46)	1.32 (1.34)	0.21
Individual empowerment score: Women	1068	0.72 (0.14)	0.73 (0.13)	-0.01	1089	0.73 (0.14)	0.71 (0.15)	0.02
Individual empowerment score: Men	1061	0.77 (0.12)	0.73 (0.12)	0.03**	1049	0.71 (0.14)	0.72 (0.13)	0.00
Panel II: secondary outcomes: agriculture								
HH average yield (in kg/acre), rabi season	731	3176.38 (3210.28)	2881.96 (3326.65)	294.42	762	3316.94 (3193.43)	3207.70 (3165.11)	109.25
HH average yield (in kg/acre), kharif season	1131	2227.09 (2467.69)	1669.26 (2178.84)	557.83**	996	2289.53 (2568.91)	1683.41 (1995.56)	606.11***
HH average agricultural revenue (in INR/acre), rabi season	731	26982.29 (35736.73)	17347.70 (36177.45)	9634.59***	762	19602.24 (26348.04)	12351.32 (25555.71)	7250.92**
HH average agricultural revenue (in INR/acre), kharif season	1131	12103.01 (18114.44)	4847.73 (11337.45)	7255.28***	996	13259.55 (24419.04)	5215.79 (15616.53)	8043.76***
HH average cost of cultivation (in INR/acre), rabi season	731	26440.41 (31143.34)	32717.20 (38545.98)	-6276.79*	762	25545.89 (22901.04)	27727.61 (25895.99)	-2181.73
HH average cost of cultivation (in INR/acre), kharif season	1131	14558.84 (25247.45)	14553.43 (30262.21)	5.41	996	11716.49 (13165.67)	9947.13 (12876.28)	1769.36
HH average cropping intensity, rabi season[α]	731	163.45 (64.54)	151.67 (66.03)	11.78	762	165.87 (68.70)	162.18 (65.82)	3.69
HH average cropping intensity, kharif season[α]	1131	126.06 (36.28)	118.64 (31.65)	7.42	996	130.81 (36.41)	123.76 (38.10)	7.05*
Panel III: secondary outcomes: pro-WEAI (women)								
Intrinsic agency								
Autonomy in income[ß]	1221	0.30 (1.82)	0.29 (1.71)	0.02	1164	0.83 (1.85)	0.66 (1.84)	0.16
Self-efficacy[δ]	1221	3.36 (1.04)	3.41 (1.00)	-0.05	1164	3.16 (1.32)	3.17 (1.30)	-0.02

	Baseline				Endline			
	N	Treatment	Control	Difference in means	N	Treatment	Control	Difference in means
No. of scenarios where respondent disagrees with Intimate Partner Violence (IPV) against women	1221	3.75 (0.67)	3.86 (0.54)	-0.11*	1164	3.84 (0.62)	3.87 (0.53)	-0.02
Instrumental agency								
No. of activities for which respondent has some input or feels can make decisions	1106	2.68 (1.54)	2.09 (1.34)	0.59***	1128	3.18 (1.71)	2.68 (1.83)	0.49*
Total assets that are solely/jointly owned by respondent	1221	7.98 (2.05)	7.91 (2.08)	0.07	1164	8.63 (1.59)	8.31 (1.76)	0.32**
No. of types of sources where respondent solely/jointly participated in credit decisions	1221	1.92 (0.91)	1.64 (0.78)	0.28***	1164	2.18 (1.28)	1.90 (1.15)	0.28**
No. of activities respondent has input in decisions on income and output from all activities participated in	1166	2.85 (1.55)	2.24 (1.38)	0.60***	1164	2.66 (1.58)	2.02 (1.56)	0.64***
No. of hours respondent worked in previous day	1221	11.68 (3.39)	11.21 (3.45)	0.47	1164	10.52 (3.08)	9.99 (3.52)	0.53**
No. of places respondent could visit if required	1220	8.71 (2.08)	8.24 (2.75)	0.47	1163	9.34 (1.24)	9.09 (1.40)	0.25**
Collective agency								
No. of types of groups respondent is an active member of	1221	2.36 (1.08)	1.18 (0.66)	1.17***	1164	1.95 (0.96)	1.12 (0.59)	0.83***
Additional +MI indicators								
No. of activities where respondent participated and received high-quality information, advice, or training	1221	1.19 (1.38)	0.18 (0.57)	1.01***	1164	1.71 (1.89)	0.90 (1.41)	0.81***
No. of products or services in which respondent participated in sales and negotiated for the household	1221	1.76 (1.43)	1.15 (1.25)	0.61***	1164	1.91 (1.46)	1.32 (1.31)	0.60***
No. of productive assets accessed solely or jointly by the respondent from FPO/co-op	1221	0.29 (0.66)	0.16 (0.54)	0.14	1164	0.44 (0.84)	0.05 (0.27)	0.39***
Panel IV: secondary outcomes: pro-WEAI (men)								
Intrinsic agency								
Autonomy in income$^{\beta}$	1218	0.50 (1.92)	0.18 (1.92)	0.32	1068	0.08 (1.52)	-0.01 (1.48)	0.09
Self-efficacy$^{\delta}$	1218	3.46 (1.20)	3.56 (1.09)	-0.10	1068	3.47 (1.18)	3.66 (0.91)	-0.19
No. of scenarios where respondent disagrees with Intimate Partner Violence (IPV) against women	1218	3.93 (0.36)	3.95 (0.28)	-0.02	1068	3.73 (0.72)	3.80 (0.57)	-0.07*

	Baseline				Endline			
	N	Treatment	Control	Difference in means	N	Treatment	Control	Difference in means
Instrumental agency								
No. of activities for which respondent has some input or feels can make decisions	1093	3.28 (1.68)	2.36 (1.51)	0.91***	1062	4.03 (1.56)	3.76 (1.56)	0.27
Total assets that are solely/jointly owned by respondent	1218	8.84 (1.61)	8.33 (1.95)	0.51***	1068	8.71 (1.45)	8.38 (1.81)	0.33
No. of types of sources where respondent solely/jointly participated in credit decisions	1218	1.71 (0.94)	1.51 (0.81)	0.20**	1068	2.02 (1.16)	1.90 (1.05)	0.12
No. of activities respondent has input in decisions on income and output from all activities participated in	1156	3.41 (1.74)	2.52 (1.54)	0.89***	1068	3.87 (1.66)	3.45 (1.72)	0.42*
No. of hours respondent worked in previous day	1218	7.86 (3.25)	8.08 (3.38)	-0.22	1068	8.03 (3.27)	7.47 (3.70)	0.57**
No. of places respondent could visit if required	1216	9.21 (1.68)	9.32 (1.50)	-0.12	1064	9.65 (0.90)	9.52 (1.12)	0.13
Collective agency								
No. of types of groups respondent is an active member of	1215	1.03 (1.51)	0.56 (1.09)	0.48**	1066	0.35 (0.73)	0.23 (0.51)	0.12**
Additional +MI indicators								
No. of activities where respondent participated and received high-quality information, advice, or training	1218	0.92 (1.57)	0.41 (1.07)	0.51**	1068	0.74 (1.16)	0.46 (0.90)	0.27**
No of products or services in which respondent participated in sales and negotiated for the household	1218	1.68 (1.26)	1.03 (1.12)	0.65***	1068	1.92 (1.37)	1.44 (1.36)	0.49***
No. of productive assets accessed solely or jointly by the respondent from FPO/co-op	1218	0.54 (0.92)	0.22 (0.65)	0.31**	1068	0.40 (0.74)	0.04 (0.24)	0.37***

Source: Authors' calculations. *p<0.10, **p<0.05, ***p<0.01. Standard deviations in parentheses. Rabi (winter) and kharif (monsoon) are the two main cropping seasons. α: Cropping intensity is defined as a ratio of gross cropped area to net sown area in a year. β: Autonomy in income is defined as a Relative Autonomy Index score that indicates being motivated by one's own values rather than coercion or fear of others' disapproval. δ: Self-efficacy is defined as "agree" or higher on average with a set of four self-efficacy questions

Table A.5. Probit model of non-attrition: PFR panel households

	(1) Without Interaction	(2) With interactions
Treatment==1	0.031***	
	(0.01)	
Primary Female Respondent: Age	0.001	0.001
	(0.00)	(0.00)
Primary Female Respondent: Years of schooling	-0.000	-0.000
	(0.00)	(0.00)
Primary Female Respondent: (1) Employed/ (0) unemployed	0.000	0.000
	(0.00)	(0.00)
Primary Female Marital status: (2) Married	0.000	0.000
	(0.00)	(0.00)
Primary Male Respondent: Age	0.000	-0.000
	(0.00)	(0.00)
Primary Male Respondent: Years of schooling	-0.001	-0.001
	(0.00)	(0.00)
Primary Male Respondent: (1) Employed/ (0) unemployed	-0.000	0.000
	(0.00)	(0.00)
Household size	0.000	0.001
	(0.00)	(0.00)
Household caste: Scheduled Caste (SC)	0.000	-0.000
	(0.00)	(0.00)
Household caste: Scheduled Tribe (ST)	-0.000	-0.000
	(0.00)	(0.00)
Household caste: Other Backward Caste (OBC)	0.000	0.000
	(0.00)	(0.00)
Household Religion: (1) Hindu	-0.000	0.000
	(0.00)	(0.00)
Household Religion: (2) Muslim	-0.000**	-0.000**
	(0.00)	(0.00)
Household Religion: (3) Christian	0.000	0.000
	(0.00)	(0.00)
Ratio of male to female in HH	0.006	0.007
	(0.01)	(0.01)
(Population (0-14) + Population (65+)) / Population (15-64)	0.006	0.003
	(0.01)	(0.01)
Total males in the HH more than 18 years	-0.005	-0.007*
	(0.01)	(0.00)
District: (2) Khunti	0.006	0.005
	(0.01)	(0.01)
District: (3) Ramgarh	0.032***	0.025***
	(0.01)	(0.01)
Treatment arm * Primary Female Respondent: Age		-0.001
		(0.00)
Treatment arm * Primary Female Respondent: Years of schooling		0.001
		(0.00)
Treatment arm * Primary Female Respondent: (1) Employed/ (0) unemployed		0.000**
		(0.00)
Treatment arm * Primary Female Marital status: (2) Married		-0.000
		(0.00)
Treatment arm * Primary Male Respondent: Age		0.001
		(0.00)
Treatment arm * Primary Male Respondent: Years of schooling		0.001
		(0.00)
Treatment arm * Primary Male Respondent: (1) Employed/ (0) unemployed		-0.003***

	(1) Without Interaction	(2) With interactions
		(0.00)
Treatment arm * Household size		0.000
		(0.00)
Treatment arm * Household caste: Scheduled Tribe (ST)		-0.003***
		(0.00)
Treatment arm * Household caste: Other Backward Caste (OBC)		-0.003***
		(0.00)
Treatment arm * Household Religion: (1) Hindu		0.005***
		(0.00)
Treatment arm * Household Religion: (3) Christian		0.005***
		(0.00)
Treatment arm * Household Religion: (6) Sarna		0.006***
		(0.00)
Treatment arm * Ratio of male to female in HH		-0.007
		(0.01)
Treatment arm * (Population (0-14) + Population (65+)) / Population (15-64)		0.007
		(0.02)
Treatment arm * Total males in the HH more than 18 years		0.009
		(0.01)
Observations	**1168**	**1134**

Source: Authors' calculations. PFR Panel households are defined as those where primary female respondents are found at both baseline and endline with the availability same baseline respondent women at endline. Margin effects, Standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01

Table A.6. Probit model of non-attrition - PMR Panel households

	(1) Without Interaction	(2) With interactions
Treatment==1	0.011	
	(0.03)	
Primary Female Respondent: Age	0.004*	0.004
	(0.00)	(0.00)
Primary Female Respondent: Years of schooling	0.002	0.003*
	(0.00)	(0.00)
Primary Female Respondent: (1) Employed/ (0) unemployed	0.000	-0.000
	(0.00)	(0.00)
Primary Female Marital status: (2) Married	0.001	0.001
	(0.00)	(0.00)
Primary Male Respondent: Age	0.001	-0.000
	(0.00)	(0.00)
Primary Male Respondent: Years of schooling	-0.001	-0.001
	(0.00)	(0.00)
Primary Male Respondent: (1) Employed/ (0) unemployed	-0.000	0.000
	(0.00)	(0.00)
Household size	-0.004	0.001
	(0.01)	(0.01)
Household caste: Scheduled Caste (SC)	-0.001	-0.000
	(0.00)	(0.00)
Household caste: Scheduled Tribe (ST)	-0.001***	-0.000*
	(0.00)	(0.00)
Household caste: Other Backward Caste (OBC)	-0.001	-0.000
	(0.00)	(0.00)
Household Religion: (1) Hindu	-0.000	0.000
	(0.00)	(0.00)
Household Religion: (2) Muslim	-0.000	-0.000
	(0.00)	(0.00)
Household Religion: (3) Christian	-0.000	0.000
	(0.00)	(0.00)
Ratio of male to female in HH	-0.003	0.004
	(0.01)	(0.01)
(Population (0-14) + Population (65+)) / Population (15-64)	-0.008	-0.006
	(0.01)	(0.02)
Total males in the HH more than 18 years	0.022	-0.004
	(0.02)	(0.02)
District: (2) Khunti	-0.002	-0.012
	(0.03)	(0.02)
District: (3) Ramgarh	0.038**	0.029*
	(0.02)	(0.01)
Treatment arm * Primary Female Respondent: Age		-0.003
		(0.00)
Treatment arm * Primary Female Respondent: Years of schooling		-0.002
		(0.00)
Treatment arm * Primary Female Respondent: (1) Employed/ (0) unemployed		0.001**
		(0.00)
Treatment arm * Primary Female Marital status: (2) Married		-0.001
		(0.00)
Treatment arm * Primary Male Respondent: Age		0.002
		(0.00)
Treatment arm * Primary Male Respondent: Years of schooling		-0.001
		(0.00)
Treatment arm * Primary Male Respondent: (1) Employed/ (0) unemployed		-0.009***

	(1) Without Interaction	(2) With interactions
		(0.00)
Treatment arm * Household size		-0.008
		(0.01)
Treatment arm * Household caste: Scheduled Caste (SC)		-0.008***
		(0.00)
Treatment arm * Household caste: Scheduled Tribe (ST)		-0.007***
		(0.00)
Treatment arm * Household caste: Other Backward Caste (OBC)		-0.007***
		(0.00)
Treatment arm * Household Religion: (1) Hindu		0.016***
		(0.00)
Treatment arm * Household Religion: (3) Christian		0.017***
		(0.00)
Treatment arm * Household Religion: (6) Sarna		0.017***
		(0.00)
Treatment arm * Ratio of male to female in HH		-0.014
		(0.01)
Treatment arm * (Population (0-14) + Population (65+)) / Population (15-64)		0.001
		(0.02)
Treatment arm * Total males in the HH more than 18 years		0.043
		(0.03)
Observations	**1168**	**1167**

Source: Authors' calculations. PMR Panel households are defined as those where primary male respondents are found at both baseline and endline. Margin effects, Standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01

Table A.7. Probit model of non-attrition – same PMR Panel households

	(1) Without Interaction	(2) With interactions
Treatment==1	-0.024***	
	(0.01)	
Primary Female Respondent: Age	-0.001	-0.002***
	(0.00)	(0.00)
Primary Female Respondent: Years of schooling	-0.003	-0.004**
	(0.00)	(0.00)
Primary Female Respondent: (1) Employed/ (0) unemployed	0.000	0.000*
	(0.00)	(0.00)
Primary Female Marital status: (2) Married	-0.000	-0.000
	(0.00)	(0.00)
Primary Male Respondent: Age	0.004***	0.003**
	(0.00)	(0.00)
Primary Male Respondent: Years of schooling	0.002	0.004***
	(0.00)	(0.00)
Primary Male Respondent: (1) Employed/ (0) unemployed	0.001***	0.001***
	(0.00)	(0.00)
Household size	-0.002	0.003
	(0.00)	(0.01)
Household caste: Scheduled Caste (SC)	-0.001***	-0.001**
	(0.00)	(0.00)
Household caste: Scheduled Tribe (ST)	-0.000*	-0.000***
	(0.00)	(0.00)
Household caste: Other Backward Caste (OBC)	-0.000	0.000
	(0.00)	(0.00)
Household Religion: (1) Hindu	-0.000	0.000
	(0.00)	(0.00)
Household Religion: (3) Christian	-0.000	0.000
	(0.00)	(0.00)
Household Religion: (6) Sarna	0.000	0.000
	(0.00)	(0.00)
Ratio of male to female in HH	0.016	0.011
	(0.01)	(0.01)
(Population (0-14) + Population (65+)) / Population (15-64)	0.007	-0.022
	(0.02)	(0.02)
Total males in the HH more than 18 years	-0.066***	-0.078***
	(0.02)	(0.01)
District: (2) Khunti	0.002	-0.007
	(0.01)	(0.01)
District: (3) Ramgarh	-0.039*	-0.037**
	(0.02)	(0.02)
Treatment arm * Primary Female Respondent: Age		0.002
		(0.00)
Treatment arm * Primary Female Respondent: Years of schooling		0.003
		(0.00)
Treatment arm * Primary Female Respondent: (1) Employed/ (0) unemployed		-0.001***
		(0.00)
Treatment arm * Primary Female Marital status: (2) Married		-0.000
		(0.00)
Treatment arm * Primary Male Respondent: Age		0.003**
		(0.00)
Treatment arm * Primary Male Respondent: Years of schooling		-0.002
		(0.00)
Treatment arm * Primary Male Respondent: (1) Employed/ (0) unemployed		0.001*
		(0.00)
Treatment arm * Household size		-0.009

	(1) Without Interaction	(2) With interactions
		(0.01)
Treatment arm * Household caste: Scheduled Caste (SC)		-0.001**
		(0.00)
Treatment arm * Household caste: Scheduled Tribe (ST)		-0.000
		(0.00)
Treatment arm * Household caste: Other Backward Caste (OBC)		-0.002**
		(0.00)
Treatment arm * Household Religion: (1) Hindu		-0.002
		(0.00)
Treatment arm * Household Religion: (3) Christian		-0.003*
		(0.00)
Treatment arm * Household Religion: (6) Sarna		-0.003
		(0.00)
Treatment arm * Ratio of male to female in HH		0.008
		(0.03)
Treatment arm * (Population (0-14) + Population (65+)) / Population (15-64)		0.075***
		(0.02)
Treatment arm * Total males in the HH more than 18 years		0.027
		(0.02)
Observations	**1027**	**1026**

Source: Authors' calculations. Same PMR Panel households are defined as those where the same primary male respondent was found at both baseline and endline. Margin effects, Standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01

Table A.8. Time allocation across various activities

Time spent on activity (in hours out of 24)	Women			Men		
	Treatment	Control	Difference in means	Treatment	Control	Difference in means
Baseline						
Self-care	13.24 (2.59)	13.59 (2.56)	-0.35	15.76 (2.95)	15.45 (3.03)	0.31
Domestic work	5.92 (2.65)	6.63 (2.81)	-0.71***	1.71 (2.24)	2.18 (2.61)	-0.48*
Non-agricultural work	1.60 (2.34)	2.15 (2.77)	-0.55*	2.31 (3.26)	3.91 (3.97)	-1.60***
Agricultural work	3.24 (2.64)	1.63 (2.14)	1.61***	4.22 (3.40)	2.46 (2.93)	1.77***
Endline						
Self-care	13.25 (2.83)	14.16 (2.83)	-0.91***	15.46 (3.30)	15.87 (3.69)	-0.42*
Domestic work	5.58 (2.44)	5.97 (2.62)	-0.38*	1.27 (2.25)	1.42 (2.46)	-0.15
Non-agricultural work	1.82 (2.53)	2.03 (2.59)	-0.20	2.79 (3.48)	4.16 (4.08)	-1.37***
Agricultural work	3.20 (2.64)	1.85 (2.22)	1.35***	4.35 (3.35)	2.41 (2.87)	1.94***

Source: Authors' calculations. Standard deviations in parentheses. *p<0.10, **p<0.05, ***p<0.01. Self-care activities include eating, sleeping, exercising, and socializing. Cooking, caring for children and adults, religious activities, and other household chores are examples of domestic work. Non-agricultural work can include starting your own business, working for someone else, and carrying out odd jobs. Agricultural work includes farming, livestock raising, pisciculture, and participation in training and FPO events.

Table A. 9. Balance in baseline characteristics by treatment arm, trimmed samples

	Trim 1: Common Support				Trim 2: Imben (2015) simulation			
	Treatment (n=580)	**Control (n=531)**	**p-value**	**nor-diff**	**Treatment (n=508)**	**Control (n=579)**	**p-value**	**nor-diff**
Primary female respondent								
Age	42.28 (11.34)	41.43 (11.59)	.2172	-0.07	42.37 (11.35)	41.87 (11.56)	.4717	-0.04
Years of schooling	4.36 (4.73)	4.88 (4.91)	.0736	0.11	4.33 (4.71)	4.62 (4.78)	.3208	0.06
Employed (=1)	92.93 (25.65)	77.78 (41.61)	<.001	-0.44	93.26 (25.09)	80.91 (39.34)	<.001	-0.37
Married (=1)	91.38 (28.09)	93.97 (23.82)	.0987	0.10	91.19 (28.37)	93.7 (24.32)	.1204	0.09
Primary male respondent								
Age	44.35 (13.4)	43.53 (13.9)	.3135	-0.06	44.37 (13.41)	43.8 (13.96)	.4941	-0.04
Years of schooling	7.02 (4.67)	7.43 (4.64)	.1517	0.09	6.98 (4.66)	7.32 (4.61)	.2412	0.07
Employed (=1)	95.69 (20.33)	92.84 (25.8)	.0405	-0.12	95.68 (20.34)	92.72 (26.01)	.0355	-0.13
Household								
Household size	5.70 (2.16)	5.40 (2.09)	.0211	-0.14	5.70 (2.17)	5.38 (2.09)	.0157	-0.15
Scheduled Caste (SC) (=1)	5.69 (23.18)	11.11 (31.46)	.0010	0.20	5.70 (23.2)	10.83 (31.1)	.0019	0.19
Scheduled Tribe (ST) (=1)	56.55 (49.61)	43.5 (49.62)	<.001	-0.26	56.82 (49.58)	45.08 (49.81)	<.001	-0.24
Other Backward Caste (OBC) (=1)	35.69 (47.95)	41.62 (49.34)	.0425	0.12	35.41 (47.86)	40.75 (49.18)	.0702	0.11
Hindu (=1)	48.1 (50.01)	57.63 (49.46)	.0015	0.19	47.84 (50)	56.3 (49.65)	.0053	0.17
Muslim (=1)	0 (0)	0 (0)	.	.	0 (0)	0 (0)	.	.
Christian (=1)	26.03 (43.92)	27.87 (44.88)	.4908	0.04	26.08 (43.94)	28.74 (45.3)	.3265	0.06
Sarna (=1)	25.86 (43.83)	14.5 (35.24)	<.001	-0.29	26.08 (43.94)	14.96 (35.7)	<.001	-0.28
Ratio of male to female in HH	1.31 (0.89)	1.34 (0.93)	.53	0.04	1.31 (0.89)	1.35 (0.93)	.4376	0.05
Dependency ratio	0.60 (0.60)	0.61 (0.59)	.9545	0.00	0.61 (0.61)	0.60 (0.59)	.7092	-0.02
Total males in the HH more than 18 years	1.88 (0.95)	1.83 (0.92)	.4041	-0.05	1.88 (0.95)	1.84 (0.92)	.4756	-0.04

	Trim 1: Common Support				Trim 2: Imben (2015) simulation			
	Treatment (n=580)	**Control (n=531)**	**p-value**	**nor-diff**	**Treatment (n=508)**	**Control (n=579)**	**p-value**	**nor-diff**
Number of children under 5	0.29 (0.58)	0.34 (0.67)	.2208	0.07	0.29 (0.58)	0.32 (0.65)	.4406	0.05
Wealth score	0.65 (2.31)	0.63 (2.46)	.8935	-0.01	0.65 (2.31)	0.63 (2.51)	.8896	-0.01
Village								
At least one government primary school (=1)	96.21 (19.12)	95.48 (20.79)	.5441	-0.04	96.2 (19.14)	95.28 (21.24)	.4503	-0.05
At least one private primary school (=1)	34.14 (47.46)	36.16 (48.09)	.4814	0.04	34.37 (47.54)	35.04 (47.76)	.8171	0.01
At least one Anganwadi centre (=1)	100 (0)	95.48 (20.79)	<.001	-0.31	100 (0)	95.28 (21.24)	<.001	-0.31
Distance to nearest town (in KM)	12.46 (5.99)	12.39 (8.88)	.8731	-0.01	12.47 (6.00)	12.53 (8.89)	.902	0.01

Source: Authors' calculations. *p<0.10, **p<0.05, ***p<0.01. The dependency ratio is defined as (number of HH members aged (0-14) + number of HH members aged (65+) / number of HH members aged (15-64). Trim 1 drops observations where common support does not hold, as shown in Appendix Figure A.1. Kernel density of propensity score across treatment and control arms Trim 2 drops observations below 0.1 and above 0.9, as suggested by Imbens (2015).

Table A.10. Robustness checks: DiD-NNM with trimmed sample and DiD-IPW, primary outcomes

Primary Outcome	DiD-NNM (original)	DiD-NNM on Trim 1 sample	DiD-NNM on Trim 2 sample	DiD-IPW
Panel I: Primary outcomes, agriculture				
HH non-productive asset count	-0.31 (0.33)	-0.29 (0.34)	-0.32 (0.34)	-0.16 (0.32)
HH productive asset count	-0.18 (0.23)	-0.14 (0.23)	-0.17 (0.23)	-0.19 (0.23)
HH average land cultivated (in acre), rabi season	-0.01 (0.03)	0.01 (0.04)	-0.00 (0.04)	-0.01 (0.04)
HH average land cultivated (in acre), kharif season	0.04 (0.13)	0.04 (0.13)	0.02 (0.13)	0.00 (0.11)
Panel II: Primary outcomes, empowerment				
Individual empowerment score: women	-0.02 (0.02)	-0.00 (0.02)	-0.00 (0.02)	-0.04* (0.02)
Individual empowerment score: men	-0.04* (0.02)	-0.05** (0.03)	-0.05* (0.03)	-0.01 (0.02)
Women				
No of activities for which respondent has some input or feels can make decisions	-0.14 (0.15)	-0.05 (0.16)	-0.09 (0.16)	-0.08 (0.15)
No of activities respondent has input in decisions on income and output from all activities participated in	0.09 (0.13)	0.17 (0.13)	0.15 (0.13)	0.02 (0.13)
No of hours respondent worked (both paid and unpaid work)	0.86*** (0.30)	0.85*** (0.30)	0.90*** (0.31)	0.72** (0.30)
Men				
No of activities for which respondent has some input or feels can make decisions	-0.64*** (0.16)	-0.68*** (0.16)	-0.71*** (0.17)	-0.49*** (0.16)
No of activities respondent has input in decisions on income and output from all activities participated in	-0.62*** (0.17)	-0.62*** (0.17)	-0.66*** (0.17)	-0.42*** (0.16)
No of hours respondent worked (both paid and unpaid work)	0.96*** (0.32)	0.91*** (0.32)	1.09*** (0.32)	1.14*** (0.30)

Source: Authors' calculations. Robust standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01. Trim 1 drops observations where common support does not hold, as shown in Appendix Figure A.1. Trim 2 drops observations below 0.1 and above 0.9, as suggested by Imbens (2015).

Table A.11. Robustness checks: DiD-NNM with trimmed sample and DiD-IPW, secondary outcomes

Secondary Outcomes	DiD-NNM (original)	DiD-NNM on Trim 1 sample	DiD-NNM on Trim 2 sample	DiD-IPW
Panel I: Secondary outcomes, agriculture				
HH average yield (in kg/acre), rabi season	-220.78 (350.90)	-255.40 (364.15)	-337.92 (367.43)	-267.76 (335.69)
HH average yield (in kg/acre), kharif season	14.13 (219.48)	45.13 (222.36)	41.80 (223.74)	-71.33 (192.86)
HH average agricultural revenue (in INR/acre), rabi season	-2,365.25 (3,020.39)	-2,766.34 (3,139.89)	-2,822.74 (3,170.06)	-2,205.76 (2,675.57)
HH average agricultural revenue (in INR/acre), kharif season	-228.73 (1,499.11)	-98.29 (1,518.05)	-117.95 (1,529.51)	457.09 (1,434.65)
HH average cost of cultivation (in INR/acre), rabi season	-974.56 (3,140.53)	-1,539.85 (3,210.19)	-1,669.99 (3,269.06)	-322.69 (3,227.24)
HH average cost of cultivation (in INR/acre), kharif season	802.94 (1,810.30)	816.38 (1,862.98)	889.66 (1,860.54)	1,019.78 (1,838.24)
HH average cropping intensity, rabi season[α]	-9.71 (9.98)	-8.02 (10.31)	-10.12 (10.37)	-12.90 (9.26)
HH average cropping intensity, kharif season[α]	-0.87 (4.54)	-0.51 (4.62)	-0.31 (4.62)	-0.46 (4.27)
Panel II: Secondary outcomes, pro-WEAI (Women)				
Intrinsic agency				
Autonomy in income[β]	0.19 (0.16)	0.14 (0.16)	0.13 (0.16)	0.22 (0.15)
Self-efficacy[δ]	0.08 (0.11)	0.14 (0.11)	0.13 (0.11)	0.04 (0.11)
No of scenarios where respondent disagrees with IPV against women	0.23*** (0.07)	0.20*** (0.07)	0.19** (0.07)	0.20*** (0.07)
Instrumental agency				
Total assets that are solely/jointly owned by respondent	0.42** (0.18)	0.48*** (0.18)	0.56*** (0.18)	0.43** (0.18)
No of types of sources where respondent solely/jointly participated in credit decisions	0.14 (0.09)	0.13 (0.09)	0.12 (0.09)	0.10 (0.08)
No of places respondent visited when required	0.21 (0.21)	0.30 (0.21)	0.26 (0.21)	0.08 (0.21)
Collective agency				
No of types of groups respondent is an active member	-0.28*** (0.07)	-0.24*** (0.07)	-0.22*** (0.07)	-0.35*** (0.07)
Additional +MI indicators				
No. of activities where respondent participated and received high-quality information, advice, or training	-0.27** (0.12)	-0.23* (0.13)	-0.26** (0.13)	-0.28** (0.12)
No of products or services in which respondent participated in sales and negotiated for the household	0.06 (0.12)	0.10 (0.12)	0.12 (0.12)	0.06 (0.11)
No. of productive assets accessed solely or jointly by the respondent from FPO/co-op	0.27*** (0.05)	0.27*** (0.05)	0.29*** (0.06)	0.34*** (0.05)
Panel III: Secondary outcomes, pro-WEAI (Men)				
Intrinsic agency				
Autonomy in income[β]	-0.23 (0.15)	-0.28* (0.15)	-0.25 (0.15)	-0.33** (0.14)
Self-efficacy[δ]	0.01 (0.13)	-0.03 (0.13)	-0.05 (0.13)	0.01 (0.12)
No of scenarios where respondent disagrees with IPV against women	-0.13 (0.09)	-0.09 (0.09)	-0.04 (0.09)	-0.05 (0.09)
Instrumental agency				

Secondary Outcomes	DiD-NNM (original)	DiD-NNM on Trim 1 sample	DiD-NNM on Trim 2 sample	DiD-IPW
Total assets that are solely/jointly owned by respondent	-0.38*	-0.25	-0.24	-0.28
	(0.22)	(0.23)	(0.23)	(0.21)
No of types of sources where respondent solely/jointly participated in credit decisions	-0.12	-0.06	-0.06	-0.10
	(0.09)	(0.09)	(0.09)	(0.08)
No of places respondent visited when required	0.18	0.26	0.32	0.28
	(0.23)	(0.23)	(0.24)	(0.24)
Collective agency				
No of types of groups respondent is an active member	-0.32***	-0.27***	-0.27***	-0.28***
	(0.08)	(0.08)	(0.09)	(0.09)
Additional +MI indicators				
No. of activities where respondent participated and received high-quality information, advice, or training	-0.29***	-0.28***	-0.27**	-0.23**
	(0.11)	(0.11)	(0.11)	(0.11)
No of products or services in which respondent participated in sales and negotiated for the household	-0.24**	-0.24**	-0.26**	-0.18*
	(0.11)	(0.11)	(0.11)	(0.10)
No. of productive assets accessed solely or jointly by the respondent from FPO/co-op	0.00	-0.00	0.02	0.05
	(0.06)	(0.06)	(0.06)	(0.06)

Source: Authors' calculations. Robust standard errors in parentheses. *p<0.10, **p<0.05, ***p<0.01. Rabi (winter) and kharif (monsoon) are the two main cropping seasons. α: Cropping intensity is defined as a ratio of gross cropped area to net sown area in a year. β: Autonomy in income is defined as a Relative Autonomy Index score that indicates being motivated by one's own values rather than coercion or fear of others' disapproval. δ: Self-efficacy is defined as "agree" or higher on average with a set of four self-efficacy questions. Trim 1 drops observations where common support does not hold, as shown in Appendix Figure A.1. Trim 2 drops observations below 0.1 and above 0.9, as suggested by Imbens (2015).

Table A.12. Baseline characteristics of treatment arm by FPO membership duration

	Treatment (n=612)	Membership (< 1.5 yrs.) (n=303)	Membership (> 1.5 yrs.) (n=309)	Difference in means
	Mean (SD) or proportion			
Primary female respondent				
Age	42.35 (11.53)	41.83 (12.02)	42.86 (11.02)	1.05
Years of schooling	4.37 (4.72)	4.63 (4.97)	4.11 (4.47)	-0.55
Employed (=1)	92.95 (25.62)	92.72 (26.03)	93.18 (25.25)	0.45
Married (=1)	91.34 (28.15)	90.76 (29.01)	91.91 (27.31)	1.45
Primary male respondent				
Age	44.39 (13.45)	44.66 (13.22)	44.13 (13.69)	-0.45
Years of schooling	7.02 (4.66)	7.03 (4.72)	7.02 (4.61)	0.00
Employed (=1)	95.58 (20.57)	95.71 (20.30)	95.45 (20.86)	-0.27
Household				
Household size	5.69 (2.19)	5.67 (2.15)	5.72 (2.22)	0.07
Scheduled Caste (SC) (=1)	6.05 (23.85)	3.96 (19.53)	8.09 (27.31)	3.84
Scheduled Tribe (ST) (=1)	55.23 (49.77)	54.46 (49.88)	55.99 (49.72)	1.72
Other Backward Caste (OBC) (=1)	36.76 (48.26)	39.60 (48.99)	33.98 (47.44)	-5.53
Hindu (=1)	48.86 (50.03)	50.17 (50.08)	47.57 (50.02)	-2.77
Muslim (=1)	0.16 (4.04)	0.33 (5.74)	0.00 (0.00)	-0.33
Christian (=1)	25.33 (43.52)	23.10 (42.22)	27.51 (44.73)	4.18
Sarna (=1)	25.65 (43.71)	26.40 (44.15)	24.92 (43.32)	-1.08
Ratio of male to female in HH	1.30 (0.88)	1.33 (0.90)	1.28 (0.87)	-0.06
Dependency ratio	0.62 (0.62)	0.64 (0.60)	0.60 (0.64)	-0.04
Total males in the HH more than 18 years	1.87 (0.94)	1.87 (0.96)	1.88 (0.92)	0.01
Number of children under 5	0.30 (0.60)	0.31 (0.62)	0.29 (0.58)	-0.02
Wealth score	-0.64 (8.74)	-1.31 (10.68)	0.03 (6.21)	1.35
Village				
At least one government primary school (=1)	95.92 (19.81)	95.05 (21.73)	96.76 (17.72)	1.71
At least one private primary school (=1)	35.46 (47.88)	38.28 (48.69)	32.69 (46.98)	-5.84
At least one Anganwadi centre (=1)	100.00 (0)	100.00 (0)	100.00 (0.00)	0.00
Distance to nearest town (in KM)	12.41 (5.98)	11.65 (5.95)	13.15 (5.91)	1.51*

Source: Authors' calculations. *p<0.10, **p<0.05, ***p<0.01. The dependency ratio is defined as (number of HH members aged (0-14) + P number of HH members aged (65+) / number of HH members aged (15-64). The normalized difference is the average value of the covariate by treatment status scaled by the standard deviation, following (Imbens, 2015).

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