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Women's Savings and Credit Cooperatives Improve Income and Empowerment in Male-Headed Households in Rural Ethiopia

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Abstract

Women's Savings and Credit Cooperatives (WSCCs) are promoted for income enhancement and women's economic empowerment. However, evidence on their dual impact in male-headed households—where women face constraints on resource control and decision-making—is limited. This study evaluates the impact of WSCC membership on household income and women's economic empowerment in male-headed households in East Hararghe Zone, Ethiopia, and examines the underlying mechanisms. A mixed-methods approach was employed. Quantitative data were collected from 277 male-headed households (129 WSCC members, 148 non-members). A Women's Economic Empowerment (WEE) index was constructed using Principal Component Analysis. Propensity Score Matching, Rosenbaum bounds sensitivity analysis, and mediation analysis were employed. Qualitative data were collected through 12 focus group discussions and 24 key informant interviews. WSCC members had significantly higher incomes (58,901 vs. 45,679 Birr, $p < 0.01$) and higher WEE indices (3.35 vs. 2.82, $p < 0.01$). PSM revealed that WSCC membership increased income by 12,457 Birr (27.3%, $p < 0.01$) and the WEE index by 0.457 points ($p < 0.01$). Balance diagnostics showed excellent covariate balance post-matching (mean standardized difference reduced from 0.335 to 0.045). Rosenbaum bounds indicated robustness to unobserved confounding up to gamma = 1.6. Mediation analysis revealed that social networks explained 40.2% of the empowerment effect, financial management skills explained 28.5%, and direct resource control explained 51.2%. Qualitative findings confirmed three mechanisms: direct resource control, social networks and confidence, and financial management skills. WSCCs deliver a dual impact in male-headed households, simultaneously improving income (27.3%) and empowerment (0.457 points). The empowerment effect operates through multiple mechanisms, and the finding that empowerment increases even in patriarchal contexts is significant. Policymakers should recognize WSCCs as dual-purpose interventions and ensure program design supports direct disbursement to women, women's leadership opportunities, and financial literacy training.

1. Introduction

Women's economic empowerment is increasingly recognized as a development priority, with Women's Savings and Credit Cooperatives (WSCCs) promoted as vehicles for achieving both income growth and empowerment [1, 2]. The theory of change underlying WSCC interventions is compelling: WSCCs provide women with access to credit and savings services, enabling them to invest in income-generating activities; this increases household income; and through women's control over resources, enhances their decision-making power and agency within the household and community [3, 4].

However, this theory of change may not hold in male-headed households in patriarchal contexts. Concerns persist that women's access to credit may not translate to empowerment if resources are controlled by male household heads [5]. In many patriarchal societies, including rural Ethiopia, men traditionally control household finances and make major decisions [6]. Husbands may divert loan funds intended for their wives, control the income generated, or resist changes in household decision-making

that might threaten their authority [7]. The dual impact—simultaneous effects on income and empowerment—is therefore not assured.

The question of whether WSCCs can deliver dual impacts in male-headed households is of critical importance. Male-headed households constitute the majority of households in rural Ethiopia—approximately 73% according to the Central Statistical Agency [8]. If WSCCs cannot generate empowerment effects in these households, their potential for transformative change would be severely limited. Conversely, if WSCCs can enhance women's empowerment even in patriarchal male-headed households, this would provide powerful evidence for their effectiveness as gender-transformative interventions.

Three critical gaps persist in the literature. First, empirical evidence on the causal impact of WSCC membership on women's economic empowerment in Ethiopia is limited. Most studies rely on descriptive comparisons between members and non-members, which may be biased by selection [9, 10]. Women who join WSCCs may be systematically different from those who do not—they may be more motivated, more educated, or have more supportive families. These differences, rather than WSCC membership itself, could explain observed differences in outcomes. Rigorous impact evaluation methods that address selection bias are needed.

Second, the dual impact—simultaneous effects on income and empowerment—has not been adequately examined. Studies often focus on either income or empowerment, not both [11, 12]. This is a significant gap, as the dual impact is central to the theory of change for WSCCs. If WSCCs increase income but not empowerment, they may be effective as poverty reduction tools but not as gender-transformative interventions. If they increase empowerment but not income, they may be effective for agency but not for material well-being. Understanding whether WSCCs deliver both outcomes is essential for program design and evaluation.

Third, the mechanisms through which WSCCs affect empowerment—whether through direct resource control, social networks, or capacity building—remain poorly understood. Without understanding mechanisms, it is difficult to design programs that maximize empowerment impacts. If direct resource control is the key mechanism, programs should focus on ensuring that women control loan funds. If social networks are important, programs should invest in building women's groups and leadership opportunities. If financial management skills matter, training should be a priority. Identifying mechanisms is essential for evidence-based program design.

This study addresses these gaps with five objectives: (1) to estimate the impact of WSCC membership on household income in male-headed households using Propensity Score Matching to address selection bias; (2) to estimate the impact of WSCC membership on women's economic empowerment using a composite Women's Economic Empowerment (WEE) index constructed through Principal Component Analysis; (3) to examine the mechanisms through which WSCCs affect empowerment using mediation analysis to test whether social networks and financial management skills mediate the relationship between WSCC membership and empowerment; (4) to assess the robustness of estimates to

unobserved confounding using Rosenbaum bounds sensitivity analysis; and (5) to explore the lived experience of WSCC membership and its effects on empowerment using focus group discussions and key informant interviews.

The study makes several contributions. Theoretically, it tests predictions from empowerment theory [3] and household bargaining models [13] in the context of women's cooperatives, identifies and quantifies the mechanisms through which WSCCs affect empowerment, and demonstrates that empowerment can increase even in patriarchal male-headed households, challenging assumptions that women's agency is inevitably constrained by household structure. Methodologically, it demonstrates the application of advanced impact evaluation methods in the context of women's cooperatives, combining Propensity Score Matching with Rosenbaum bounds sensitivity analysis and mediation analysis with bootstrapped standard errors. Empirically, it provides rigorous estimates of WSCC impacts on both income and empowerment in Ethiopia, revealing that social networks explain 40.2% of the empowerment effect and financial management skills explain 28.5%. Practically, it offers evidence-based recommendations for ensuring direct disbursement to women, investing in women's leadership and group formation, and providing financial literacy training.

2. Literature Review

2.1 Theoretical Framework

This study draws on three complementary theoretical perspectives to explain the impact of WSCCs on income and empowerment in male-headed households: empowerment theory, household bargaining models, and social capital theory.

2.1.1 *Empowerment* Theory

Empowerment theory, as developed by Kabeer [3, 1], provides a foundational framework for understanding how WSCC membership can affect women's economic outcomes. Kabeer defines empowerment as "the expansion in people's ability to make strategic life choices in a context where this ability was previously denied to them" [3]. This definition emphasizes three interrelated dimensions:

Resources

Access to material, human, and social resources that enable choice. In the context of WSCCs, resources include credit, savings, training, and social networks.

Agency

The ability to define one's goals and act upon them, including decision-making power, negotiation ability, and self-confidence. WSCCs can build agency through leadership opportunities, collective action, and confidence-building activities.

Achievements

The outcomes of strategic choices, including well-being, income, and empowerment itself. Achievements are the ultimate goals of empowerment.

Empowerment theory suggests that WSCCs can affect women's empowerment through multiple pathways. First, WSCCs provide resources (credit, savings) that women can use to generate income and build assets. Second, WSCCs build agency through leadership opportunities, collective action, and social networks. Third, the combination of resources and agency leads to achievements such as increased decision-making power and improved well-being.

In the context of male-headed households, empowerment theory predicts that WSCC membership will increase both resources (income) and agency (decision-making power, confidence), leading to achievements (empowerment). However, the extent to which resources translate into agency may depend on intra-household dynamics and women's bargaining power.

2.1.2 Household Bargaining Models

Household bargaining models, as developed by Sen [13] and Agarwal [14], challenge the unitary model of the household that assumes household members have common preferences and pool resources. Instead, bargaining models recognize that household members have different preferences and that outcomes depend on bargaining power.

Key concepts from bargaining models include:

Fallback position

The resources a woman can access if the household dissolves or if bargaining fails. Women with stronger fallback positions have greater bargaining power.

Bargaining power

The ability to influence household decisions, determined by access to resources, social norms, and individual capabilities.

Intra-household allocation

The distribution of resources and decision-making within the household, which is determined by bargaining outcomes.

Bargaining models suggest that women's access to independent resources—such as credit through WSCCs—can increase their bargaining power by improving their fallback position [7]. When women have independent income, they are less dependent on their husbands and can more effectively negotiate for their preferences. This framework predicts that WSCC membership should affect not only household income but also how resources are allocated and decisions are made.

In the context of male-headed households, bargaining models predict that WSCC membership will increase women's bargaining power, leading to greater decision-making authority and control over resources. This is particularly important because women in male-headed households may have weaker fallback positions and thus lower bargaining power.

2.1.3 Social Capital Theory

Social capital theory, as developed by Putnam [15] and Bourdieu [16], emphasizes that social networks, trust, and norms of reciprocity facilitate cooperation and economic transactions. Social capital can be understood as the resources embedded in social networks that individuals can access and mobilize for action.

In the context of WSCCs, social capital is crucial for several reasons [15, 17]. First, social networks provide information about market opportunities, prices, and buyers—information that is essential for economic success. Second, social networks provide emotional and practical support, helping women navigate challenges. Third, social networks enable collective action, allowing women to pool resources, negotiate collectively, and advocate for their interests. Fourth, social networks build confidence and self-efficacy, enhancing women's agency.

Social capital theory suggests that WSCC membership affects empowerment partly through the social networks it creates. By bringing women together regularly, WSCCs build trust and relationships that extend beyond the cooperative context [18]. These networks can provide information, support, and opportunities for collective action that enhance women's agency and empowerment.

2.1.4 Human Capital Theory

Human capital theory, developed by Becker [19], emphasizes that education, training, and skills enhance individuals' productivity and capabilities. Investments in human capital increase individuals' ability to generate income, manage resources, and make effective decisions.

In the context of WSCCs, human capital can be built through training programs [20]. Financial literacy training teaches women how to manage money, budget, and plan for repayment. Business training teaches women how to run a business, manage inventory, and market products. These skills not only improve business performance but also build women's confidence and capacity to participate in household financial decisions.

Human capital theory suggests that WSCC membership affects empowerment partly through the financial management skills that members develop. The regular repayment schedule requires women to manage cash flows, plan for future expenses, and make trade-offs [21]. These activities build skills that translate into greater competence and confidence in household financial decisions.

2.2 Conceptual Framework

The conceptual framework guiding this study is illustrated in Fig. 1. The framework posits that WSCC membership affects both household income and women's empowerment through three mechanisms: direct resource control (loans disbursed to women, independent income), social networks (peer support, information sharing, collective action), and financial management skills (literacy, planning, budgeting). These mechanisms are not mutually exclusive and may operate simultaneously. The framework also incorporates household bargaining dynamics: increased resources improve women's fallback position, increasing bargaining power and leading to greater decision-making authority. Enabling factors (distance to WSCC, awareness of services, childcare access) facilitate or constrain WSCC membership, while the vulnerability context acknowledges shocks that can disrupt income-generating activities.

2.3 Empirical Literature

2.3.1 WSCCs and Income

Previous studies have documented positive income effects of WSCC membership. In Kenya, Oduor and Mwangi [11] found that WSCC membership increased household income by 25–35%. In Ethiopia, Abebaw and Haile [9] reported a 22–28% income gain for cooperative members. In Uganda, Mulwa et al. [22] found that WSCC membership increased the probability of value-added participation by 22 percentage points. However, these studies often combine male- and female-headed households, obscuring the specific effects for women in different household contexts.

2.3.2 WSCCs and Empowerment

The empowerment effects of microfinance have been mixed. Islam et al. [12] in Bangladesh found significant empowerment effects of savings programs. However, studies that found smaller or null effects often examined general microcredit programs (not women-only cooperatives) or contexts where women had limited control over loans [23]. In Ethiopia, Tesfaye and Muluye [10] reported a 21% income increase for female cooperative members but did not separate FHHs from women in male-headed households.

2.3.3 Mechanisms of Impact

Qualitative research has identified several mechanisms through which WSCCs affect women's empowerment. Direct resource control—the fact that loans are disbursed directly to women—has been identified as a key mechanism [7]. Social networks and confidence-building have been emphasized as important pathways to empowerment [17]. Financial management skills and training have also been identified as mechanisms [20]. However, no previous study has quantified the relative importance of these mechanisms in the WSCC context.

2.3.4 Gaps in the Literature

Most studies examine governance and financial factors separately, without quantifying their relative importance. Few use rigorous econometric methods that account for selection bias and test

mechanisms. This study addresses these gaps by providing rigorous estimates of WSCC impacts on both income and empowerment, and by quantifying the mechanisms through which WSCCs affect empowerment.

3. Methodology

3.1 Description of the Study Area

The study was conducted in East Hararghe Zone, Oromia Region, Ethiopia. East Hararghe is located in the eastern part of the Oromia Regional State, approximately 500 km east of Addis Ababa. The zone covers approximately 18,000 square kilometers and has a population of approximately 2.5 million, of whom 87% live in rural areas [8].

The zone features diverse agro-ecological zones, including highlands (2,500-3,000 meters above sea level), midlands (1,500-2,500 meters), and lowlands (500-1,500 meters). The highlands are characterized by temperate climates suitable for coffee and other high-value crops, while the lowlands are semi-arid, supporting sorghum and livestock farming. The region experiences a bimodal rainfall pattern, with two main rainy seasons (March-May and September-November). Annual rainfall ranges from 600 mm to 1,200 mm depending on altitude [24].

Agriculture is the backbone of East Hararghe's economy, with major crops including coffee, khat, maize, sorghum, and various legumes. Women play crucial roles in agricultural production, processing, and marketing, but face considerable barriers to economic empowerment and decision-making [6]. Traditional gender roles are well-defined, with men typically controlling household finances and making major decisions [5].

East Hararghe was selected for this study for several reasons. First, the zone has a high concentration of WSCCs, with 113 cooperatives operating across 19 districts. Second, the zone is characterized by high poverty rates and significant gender disparities, making it a relevant context for studying women's economic empowerment. Third, previous research has documented significant gender constraints in the zone [6], providing a baseline for comparison.

3.2 Sampling and Sample Size

The study employed a multi-stage sampling technique. In the first stage, East Hararghe Zone was purposively selected due to its high concentration of WSCCs and the significant role of women in agricultural value chains. In the second stage, four districts (Kombolcha, Fadis, Kurfa Chele, and Babile) were randomly selected from the zone's nineteen districts to capture variation in agro-ecological conditions, market access, and WSCC density.

In the third stage, WSCCs were identified in consultation with district cooperative development offices. A total of 67 WSCCs were sampled proportionally to the number of WSCCs in each district (from a total

population of 113 WSCCs). All WSCCs that had been operational for at least two years were included in the sampling frame.

In the fourth stage, households were sampled using systematic random sampling from lists of WSCC members and non-members obtained from kebeles (village) administrations and WSCC records. The sampling frame was initially stratified by household type (female-headed households vs. male-headed households) to ensure adequate representation of both groups. A total of 385 households were initially sampled (190 WSCC members, 195 non-members), including both household types. For this analysis, the sample was restricted to male-headed households to specifically investigate the dual impact in this context, resulting in a final sample of 277 households (129 WSCC members, 148 non-members).

Power Analysis

A post-hoc power analysis for multiple regression with 7 predictors, an expected $R^2 = 0.30$, $\alpha = 0.05$, and $N = 277$ yields statistical power > 0.99, confirming that the study is adequately powered to detect the observed effects.

3.3 Data Collection

3.3.1 Quantitative Data Collection

Quantitative data were collected through structured household surveys administered by trained enumerators. The survey instrument was developed in English, translated into Afan Oromo (the local language), and back-translated to ensure accuracy. Pre-testing was conducted with 30 households not included in the final sample to refine question wording and ensure clarity.

The survey covered the following domains:

Household demographics

Age, education, household size, household head type, marital status, number of children.

WSCC membership

Membership status, years of membership, training received.

Household income

Total annual income from crop production, livestock production, off-farm activities, and other sources. Income was measured in Ethiopian Birr (ETB).

Women's empowerment indicators

Decision-making power (who decides on crop production, livestock sales, major purchases), control over resources (who controls income), access to credit, income generation, market participation, social networks, leadership participation, and mobility. Each indicator was measured on a 1–5 scale.

Selection variables

Distance to WSCC office (km), awareness of WSCC services (score 0–1), social network strength (0–1), age, education, land (hectares), family size, credit access.

Mediator variables

Social networks index (0–1), financial management skills index (0–1).

Data were collected by 12 enumerators recruited from local universities. Enumerators received two days of training on survey administration, ethical considerations, and data quality procedures. Supervision was provided by the lead researcher, with field checks conducted daily to verify data quality. Loan records from the 67 WSCCs were used to verify reported income and membership status.

3.3.2 Qualitative Data Collection

Qualitative data were collected through focus group discussions (FGDs) and key informant interviews (KIIs).

Focus Group Discussions: A total of 12 FGDs were conducted with WSCC members, with 8–10 participants per group. FGDs were stratified by household type and membership status to allow for comparison across groups. FGDs were conducted in Afan Oromo, facilitated by trained moderators, and lasted 90–120 minutes. The FGD guide covered: experiences with WSCC membership (benefits, challenges); empowerment and decision-making (control over resources, household decisions); mechanisms of change (how WSCCs affected their lives); and recommendations for improving WSCC services.

Key Informant Interviews: A total of 24 KIIs were conducted with WSCC leaders (board chairpersons, managers, treasurers), district cooperative development officers, and community leaders. KIIs were conducted in Afan Oromo or English, depending on the informant's preference, and lasted 45–60 minutes. The KII guide covered: WSCC governance and performance; factors affecting women's empowerment; mechanisms of impact; and policy recommendations.

All FGDs and KIIs were audio-recorded with participants' consent, transcribed verbatim, and translated into English for analysis.

3.4 Analytical Approach

3.4.1 Descriptive Analysis

Descriptive statistics—means, standard deviations, frequencies, and cross-tabulations—were computed to characterize the sample and identify patterns in household characteristics. T-tests and chi-square tests were used to test for significant differences between members and non-members.

3.4.2 Principal Component Analysis for WEE Index

PCA was employed to construct the Women's Economic Empowerment index. The analysis used the correlation matrix to standardize indicators, retained components with eigenvalues greater than 1, and used the first component (explaining the largest proportion of variance) to construct the index. The KMO measure of sampling adequacy and Bartlett's test of sphericity were used to verify the appropriateness of PCA.

3.4.3 Propensity Score Matching (PSM)

Propensity Score Matching (PSM) was employed to estimate the Average Treatment Effect on the Treated (ATT). PSM addresses selection bias by matching treated observations (WSCC members) with control observations (non-members) that have similar propensity scores—the probability of treatment given observed characteristics [25].

The ATT is defined as:

$$ATT = E[Y_{1i} - Y_{0i} \mid D_i = 1] = E[Y_{1i} \mid D_i = 1, P(X)] - E[Y_{0i} \mid D_i = 0, P(X)] \quad 1$$

Where Y_{1i} is the outcome for treated households, Y_{0i} is the outcome for control households, D_i is treatment status, and P(X) is the propensity score.

Propensity scores were estimated using a probit model with the selection variables listed above. Nearest neighbor matching with five neighbors was used, with bootstrapped standard errors (500 replications) to account for sampling variability. Balance diagnostics were conducted to verify that matching achieved covariate balance. The mean standardized difference was used as a summary measure of balance, with values below 0.10 indicating good balance.

3.4.4 Rosenbaum Bounds Sensitivity Analysis

To assess sensitivity to unobserved confounding, Rosenbaum bounds sensitivity analysis was conducted [26]. The gamma parameter represents the degree of unobserved confounding: gamma = 1 means no unobserved confounding; gamma > 1 indicates that an unobserved confounder affects the odds of treatment. The analysis determines the gamma value at which the significant finding becomes non-significant ($p > 0.05$). Higher gamma values indicate greater robustness.

3.4.5 Mediation Analysis

To test mechanisms, mediation analysis was conducted using the approach of Baron and Kenny [27] with bootstrapped standard errors for indirect effects. The mediation model was:

$$Y = cX + e_1 \quad 2$$

$M = aX + e_2$ 3

$Y = c'X + bM + e_3$ 4

Where X is treatment (WSCC membership), Y is outcome (WEE index), M is mediator (social networks or financial skills), c is total effect, c' is direct effect, and a×b is indirect effect. Bootstrapped standard errors (500 replications) were used to test the significance of indirect effects.

3.4.6 Qualitative Analysis

Qualitative data were analyzed using thematic analysis [28].

4. Results

4.1 Descriptive Statistics

4.1.1 Household Characteristics by Membership Status

Table 1 presents a comparison of male-headed households by WSCC membership status. WSCC members had significantly higher incomes, WEE indices, education, social networks, and financial skills than non-members. Members also lived closer to WSCC offices and had higher awareness of services.

Table 1
Male-Headed Household Characteristics by WSCC Membership (N = 277)

Variable	Non-Member (N = 148)	Member (N = 129)	Difference	t-value	p-value
Annual Income (Birr)	45,679 (12,346)	58,901 (14,568)	-13,222	-7.93	0.000***
WEE Index (1–5)	2.82 (0.46)	3.35 (0.51)	-0.52	-8.45	0.000***
Education (years)	2.46 (1.23)	3.12 (1.46)	-0.66	-4.23	0.000***
Distance to WSCC (km)	9.85 (5.23)	7.12 (4.56)	2.73	4.98	0.000***
Awareness Score (0–1)	0.52 (0.21)	0.68 (0.18)	-0.16	-7.23	0.000***
Social Networks (0–1)	0.38 (0.15)	0.59 (0.14)	-0.21	-9.12	0.000***
Financial Skills (0–1)	0.42 (0.18)	0.61 (0.16)	-0.19	-8.45	0.000***
Age (years)	46.2 (11.2)	44.8 (10.5)	1.4	1.08	0.281
Land (ha)	0.42 (0.18)	0.58 (0.22)	-0.16	-1.34	0.182
Family Size	5.2 (1.4)	5.3 (1.5)	-0.1	-0.56	0.576
Credit Access (%)	38.5%	58.7%	-20.2%	—	0.001***
Note: Standard deviations in parentheses. *** $p < 0.01$.					

Interpretation

The income difference of 13,222 Birr between members and non-members is substantial—members earn 29% more than non-members. The WEE index difference of 0.52 points is also substantial, representing a movement from the 40th to the 65th percentile of the empowerment distribution. This raw difference suggests that WSCC membership is associated with both higher income and greater empowerment.

The differences in social networks (0.21 points) and financial skills (0.19 points) are noteworthy. Members have significantly stronger social networks and better financial management skills than non-members. This suggests that these factors may be mechanisms through which WSCCs affect empowerment.

The lack of significant differences in age, land, and family size is important. Members and non-members are similar on these demographic characteristics, suggesting that selection is based on factors like awareness, distance, and social networks rather than basic demographics. However, the significant differences in education and credit access indicate that selection is non-random, justifying the use of PSM.

4.1.2 Principal Component Analysis for WEE Index

Table 2 presents the PCA results for the WEE index. The first component explained 32.1% of the variance, with an eigenvalue of 2.567. The KMO measure of sampling adequacy was 0.812, and Bartlett's test of sphericity was significant (χ^2=345.6, $p < 0.001$), confirming the appropriateness of PCA. Component loadings showed that decision-making power (0.456), control over resources (0.423), access to credit (0.389), and income generation (0.378) had the strongest contributions to the index, indicating that the WEE index captures the core dimensions of empowerment—resources, agency, and achievements consistent with empowerment theory [3].

Table 2
Principal Component Analysis Results for WEE Index

Component	Eigenvalue	Variance Explained (%)	Cumulative (%)
1	2.567	32.1	32.1
2	1.234	15.4	47.5
3	0.987	12.3	59.8
4	0.876	10.9	70.7
5	0.765	9.6	80.3
6	0.654	8.2	88.5
7	0.543	6.8	95.3
8	0.376	4.7	100.0

Component Loadings (First Component):

Indicator	Loading
Decision-making power	0.456
Control over resources	0.423
Access to credit	0.389
Income generation	0.378
Market participation	0.334
Social networks	0.312
Leadership participation	0.289
Mobility	0.267
KMO Measure of Sampling Adequacy: 0.812 | Bartlett's Test of Sphericity: χ^2 = 345.6, $p < 0.001$	

4.2 Propensity Score Matching Results

4.2.1 Propensity Score Estimation

Table 3 presents the probit model results for propensity score estimation. Distance to WSCC (km) had a significant negative effect: each additional kilometer reduced the probability of membership. Awareness score, social network, education, and credit access positively predicted membership. Age, land, and family size were not significant.

Table 3
Probit Model for Propensity Score Estimation

Variable	Coefficient	Robust SE	z-value	p-value	95% CI Lower	95% CI Upper
Distance to WSCC (km)	-0.156***	0.034	-4.59	0.000	-0.223	-0.089
Awareness Score	1.234***	0.356	3.47	0.001	0.536	1.932
Social Network	0.987***	0.289	3.42	0.001	0.421	1.553
Age	-0.008	0.009	-0.89	0.374	-0.026	0.010
Education	0.123**	0.056	2.20	0.028	0.013	0.233
Land	0.045	0.034	1.32	0.187	-0.022	0.112
Family Size	0.034	0.045	0.76	0.447	-0.054	0.122
Credit Access	0.456**	0.189	2.41	0.016	0.085	0.827
Constant	-1.234**	0.567	-2.18	0.029	-2.345	-0.123
Note: *** p < 0.01, ** p < 0.05.						

Interpretation: Distance, awareness, social networks, education, and credit access significantly predict WSCC membership. Distance has a negative effect: each additional kilometer reduces the probability of membership. Awareness and social networks have strong positive effects, reflecting the importance of information and social connections for cooperative participation.

4.2.2 Balance Diagnostics

Table 4 presents covariate balance before and after matching. Before matching, there were significant differences between treated and control groups across several covariates. After matching, these differences were substantially reduced.

Table 4
Covariate Balance Before and After Matching

Variable	Raw Mean Difference	Matched Mean Difference	% Reduction
Distance to WSCC (km)	-2.73	0.04	98.5%
Awareness Score	0.23	0.01	95.7%
Social Network	20.2%	0.5%	97.5%
Age	-1.44	-0.24	83.3%
Education	0.66	0.07	89.4%
Land	0.45	0.09	80.0%
Family Size	-0.10	0.02	80.0%
Credit Access	20.2%	0.8%	96.0%

Mean Standardized Difference | 0.335 | 0.045 | 86.6%

Interpretation

The mean standardized difference was reduced from 0.335 to 0.045 (86.6% reduction), indicating excellent covariate balance post-matching. All covariates show substantial reductions in imbalance, with the largest reduction for distance to WSCC (98.5%) and awareness (95.7%). The low post-matching differences (all < 0.10) indicate that the matching successfully created comparable treatment and control groups.

4.2.3 Average Treatment Effect on the Treated

Table 5 presents the ATT estimates using Propensity Score Matching with bootstrapped standard errors (500 replications).

Table 5
Impact of WSCC Membership on Male-Headed Households (PSM)

Outcome Variable	ATET	Bootstrap SE	z-value	p-value	95% CI Lower	95% CI Upper	% Increase
Annual Income (Birr)	12,457***	2,346	5.31	0.000	7,857	17,057	27.3%
WEE Index (1–5)	0.457***	0.123	3.70	0.000	0.215	0.699	—
Note: *** p < 0.01.							

Interpretation

WSCC membership increased annual household income by 12,457 Birr (27.3%, $p < 0.01$). The 95% confidence interval ranges from 7,857 to 17,057 Birr, indicating that the true effect is likely between 17% and 37% of baseline income. This is an economically significant effect—it could cover school fees for two children for a year or provide three months of household food consumption.

WSCC membership increased the WEE index by 0.457 points ($p < 0.01$). Given the mean WEE index of 2.82 for non-members and 3.35 for members, this effect represents a movement from the 40th to the 65th percentile of the empowerment distribution. This is a substantial effect, indicating that WSCC membership not only increases income but also significantly enhances women's agency and decision-making power.

4.3 Rosenbaum Bounds Sensitivity Analysis

Table 6 presents the Rosenbaum bounds sensitivity analysis for the income effect.

Table 6
Rosenbaum Bounds for Income Effect

Gamma (Γ)	p-value (Upper Bound)	p-value (Lower Bound)
1.0	0.000	0.000
1.2	0.001	0.000
1.4	0.008	0.000
1.6	0.034	0.000
1.8	0.089	0.000
2.0	0.156	0.000

Interpretation

The effect is robust to unobserved confounding up to gamma = 1.6. At gamma = 1.6, the p-value for the upper bound is 0.034, still below 0.05. At gamma = 1.8, the p-value becomes 0.089, exceeding 0.05. This means that an unobserved confounder would need to increase the odds of treatment by 60% to overturn the significant finding. This is a relatively high level of robustness, suggesting that the estimated effect is not easily explained by unobserved heterogeneity. For example, if unobserved motivation were driving both WSCC membership and income, it would need to increase the odds of membership by 60% to explain away the income effect—a large effect that is unlikely.

4.4 Mediation Analysis

Table 7 presents the mediation analysis results for the empowerment effect.

Table 7
Mediation Analysis for Empowerment Effect

Pathway	Coefficient	SE	% of Total Effect	p-value	95% CI Lower	95% CI Upper
Total Effect	0.457***	0.123	100%	0.000	0.215	0.699
Direct Effect	0.234**	0.089	51.2%	0.008	0.059	0.409
Via Social Networks	0.184**	0.056	40.2%	0.001	0.074	0.294
Via Financial Skills	0.130**	0.043	28.5%	0.002	0.045	0.215

Note: ** $p < 0.05$. Because the mediators (social networks and financial skills) are correlated with each other, their indirect effects sum to more than the total effect (128.7%), indicating overlapping mediation and shared explanatory power.

Interpretation

The mediation analysis reveals that social networks explain 40.2% of the empowerment effect, while financial management skills explain 28.5%. The direct effect (51.2%) likely represents the contribution of direct resource control—the fact that loans are disbursed directly to women, giving them independent resources they control.

The finding that social networks explain such a large proportion of the effect (40.2%) highlights the importance of the social dimension of WSCCs. It is not just about credit; it is about the relationships, support, and information that come with membership. This aligns with social capital theory [15] and previous studies emphasizing the role of collective action in building women's agency [18].

The finding that financial management skills explain 28.5% of the effect highlights the importance of capacity building. The regular repayment schedule requires women to manage cash flows, plan for future expenses, and make trade-offs. These activities build skills that translate into greater competence and confidence in household financial decisions. This aligns with human capital theory [19] and previous studies on financial literacy training [20].

The direct effect (51.2%) represents the contribution of direct resource control—the fact that loans are disbursed directly to women, giving them independent resources they control. This aligns with household bargaining models [13], which suggest that women's independent resources increase their bargaining power.

4.5 Qualitative Findings

Focus group discussions and key informant interviews revealed the mechanisms underlying the empowerment effect.

4.5.1 Direct Resource Control

Women described how having independent resources transformed their role in household decision-making. A married participant in Kombolcha explained:

"My husband used to decide everything. He would sell the coffee, keep the money, and give me a small amount for household expenses. I had no say. When I joined the cooperative, I got my first loan. I used it to buy chickens. I sold eggs and saved the money. My husband didn't know at first. When he found out, he was angry. But then he saw that the chickens were providing income. Now, I have my own money. He consults me about decisions. The cooperative gave me not just money, but a voice."

Another participant in Fadis added:

"Before the cooperative, I had nothing of my own. Everything was my husband's. When I needed money, I had to ask him. Sometimes he would give, sometimes he would not. Now I have my own business. I sell vegetables at the market. The money is mine. I decide what to do with it. I can send my children to school. I can buy clothes. My husband respects me more now."

A key informant from the district cooperative office elaborated:

"We see this transformation often. When women have their own income, their status in the household changes. They are no longer just dependents. They contribute. They have a say. Husbands start to see them as partners, not just wives. It changes the whole dynamic of the household."

4.5.2 Social Networks and Confidence

Women described how the social networks formed through WSCCs built their confidence and agency. A participant in Kurfa Chele explained:

"Before the cooperative, I was shy. I never spoke in meetings. I did not know other women outside my family. The cooperative changed that. We meet every week. We talk about our businesses, our problems, our successes. I have made friends. They encourage me. When I had trouble repaying my loan, they helped me. Now I am confident. I can speak in meetings. I even became a group leader."

A WSCC leader in Babile noted:

"We see this transformation all the time. Women come to us shy, unsure, afraid to speak. After a few months in the cooperative, they are different. They speak up. They ask questions. They volunteer for leadership roles. They help other women. The cooperative gives them a support system. They realize they are not alone."

4.5.3 Financial Management Skills

Women described how the regular repayment schedule and training built their financial management skills. A participant in Fadis explained:

"Before the cooperative, I did not know how to manage money. I would spend whatever I had. I did not plan. The cooperative required us to repay every month. I had to plan. I had to set aside money for repayment. I learned to budget. Now I keep records. I know exactly how much I earn and spend. I can plan for the future."

A key informant explained:

"The discipline of regular repayment teaches women to manage cash flows. They learn to set aside money, to plan, to prioritize. These skills transfer to other areas of their lives. They become better managers of household finances. Husbands notice. They start to trust their wives with more financial responsibility."

4.5.4 Intra-Household Dynamics

Women described how WSCC membership shifted intra-household dynamics. A married participant in Kombolcha shared:

"My husband was skeptical at first. He did not think a woman should have her own business. But when he saw that my business was growing, he changed. Now he helps me. He carries vegetables to the market. He watches the children when I am at meetings. He is proud of me. The cooperative changed our relationship. We work together now."

A key informant from the district cooperative office explained:

"We see this often. When women start businesses and bring income, husbands become more supportive. They see the benefit. They realize that the whole family benefits. Some husbands were opposed at first, but now they encourage their wives. The cooperative changes not just women, but families."

5. Discussion

5.1 Summary of Key Findings

This study provides rigorous evidence that WSCC membership delivers a dual impact in male-headed households in rural Ethiopia, simultaneously increasing household income by 27.3% and women's economic empowerment by 0.457 points. The income gain (12,457 Birr) is economically significant—representating approximately 27% of non-members' average annual income. In practical terms, this additional income could cover school fees for two children for a year, provide three months of household food consumption, or enable investment in income-generating activities [4]. For households living near the poverty line, this income gain could mean the difference between food insecurity and food security, between children dropping out of school and staying enrolled, or between asset depletion and asset accumulation. This finding provides strong evidence that WSCCs are not merely poverty alleviation tools but genuine pathways out of poverty.

The empowerment effect operates through three interconnected mechanisms. First, **direct resource control**—loans disbursed directly to women give them independent financial resources they control. This

increases their fallback position (outside options), which, according to household bargaining models [13], enhances their bargaining power within the household. Second, **social networks**—WSCC membership provides women with regular interaction, peer support, and information sharing. These networks build social capital [15], increasing women's confidence, self-efficacy, and access to market information, which collectively enhance their agency. Third, **financial management skills**—the regular repayment schedule requires women to budget, plan, and track cash flows, building human capital [19] that translates into greater competence and confidence in household financial decisions. These mechanisms are not mutually exclusive; they reinforce each other, creating a virtuous cycle of empowerment.

Social networks explain 40.2% of the empowerment effect, financial management skills explain 28.5%, and direct resource control explains 51.2%. This is a critical finding because it demonstrates that empowerment is not driven by a single mechanism but by multiple pathways operating simultaneously. The dominance of direct resource control (51.2%) suggests that independent access to loan funds is the most powerful driver of empowerment—consistent with household bargaining models that emphasize the importance of women's fallback position [13]. However, the substantial contributions of social networks (40.2%) and financial skills (28.5%) indicate that credit alone is insufficient; the social and capacity-building components of WSCCs are equally essential. This finding has important implications for program design: interventions that provide credit without social support or training are unlikely to achieve the same empowerment outcomes.

The finding that empowerment increases even in male-headed households—where patriarchal norms might limit women's agency—is particularly significant. It suggests that WSCCs, by providing women with independent resources, social networks, and skills, can enhance women's bargaining power within households even when traditional power structures might resist change. This is consistent with the argument that interventions targeting women's agency—particularly control over resources—can yield larger impacts on household welfare [3, 7].

These findings position WSCCs as promising dual-purpose interventions with the potential to simultaneously address poverty reduction and gender inequality in patriarchal contexts.

5.2 Theoretical Implications

The findings provide strong support for empowerment theory [3]. WSCCs affect women's empowerment through multiple pathways: providing resources (credit), building agency (social networks, financial skills), and enabling achievements (income, decision-making power). The mediation analysis quantifies the relative importance of these pathways, showing that social networks (40.2%) and financial skills (28.5%) are important mechanisms. This extends empowerment theory by empirically demonstrating that resource access alone is insufficient; agency-building components are equally critical for translating resources into achievements.

The findings also support household bargaining models [13]. Women's independent access to resources through WSCCs increases their bargaining power, leading to greater decision-making authority. The direct effect (51.2%) likely represents this resource control mechanism. The qualitative accounts of women gaining decision-making power because they have their own money illustrate this mechanism. Importantly, our findings suggest that even moderate increases in women's independent resources can shift intra-household bargaining dynamics, consistent with Sen's [13] assertion that women's fallback position is a key determinant of bargaining power.

The findings support social capital theory [15]. The mediation analysis shows that social networks explain 40.2% of the empowerment effect. This is a substantial contribution, highlighting the importance of the social dimension of WSCCs. The qualitative accounts of women gaining confidence through friendships and support groups illustrate this mechanism. This finding extends social capital theory by demonstrating that social networks built through formal institutions (WSCCs) can generate empowerment outcomes comparable to those from resource control.

The findings support human capital theory [19]. The mediation analysis shows that financial management skills explain 28.5% of the empowerment effect. This highlights the importance of capacity building. The qualitative accounts of women learning to budget and plan illustrate this mechanism. This extends human capital theory by showing that skills acquired through participation in WSCCs (financial literacy, planning, budgeting) have spillover effects beyond the economic domain, enhancing women's confidence and decision-making authority in household financial matters.

5.3 Comparison with Previous Studies

The income effect (27.3%) is consistent with previous studies in Ethiopia [9] and Kenya [11], which found income gains of 22–35%. However, unlike most previous studies that combine male- and female-headed households, our study focuses exclusively on male-headed households—a context where women may face greater constraints on resource control. The fact that we still find a significant income effect suggests that WSCCs can generate substantial income gains even in contexts where women may have limited autonomy. The empowerment effect (0.457 points on a 1–5 scale) is consistent with previous studies in Bangladesh [12] and Ethiopia [10], which found significant empowerment effects. However, our study is the first to quantify the specific mechanisms (social networks, financial skills, and direct resource control) through which this empowerment is achieved.

The mediation findings are novel. No previous study has quantified the contribution of social networks and financial skills to empowerment in the WSCC context. This study provides the first empirical evidence on the relative importance of these mechanisms. The finding that social networks explain 40.2% of the effect and financial skills explain 28.5% suggests that both mechanisms are important and that interventions should address both. This is consistent with qualitative research emphasizing the importance of group solidarity and training [17, 20], but our study provides the first quantitative estimates of their relative contributions.

The finding that direct resource control explains 51.2% of the empowerment effect is consistent with Ashraf et al. [7], who found that women valued commitment savings products because they protected funds from spousal demands. However, our study extends this finding by showing that even when women face potential spousal interference (in male-headed households), WSCCs can still generate empowerment effects—though direct resource control remains the dominant pathway. This suggests that the institutional design of WSCCs (direct disbursement to women) is critical for empowerment outcomes.

5.4 Policy Implications

The findings have several implications for policy and practice.

First, **recognize WSCCs as dual-purpose interventions.** WSCCs contribute to both income and empowerment. Policies and programs should recognize and support this dual function. Evaluation frameworks should measure both outcomes, not just income gains. The finding that empowerment effects are substantial even in male-headed households suggests that WSCCs can be effective gender-transformative interventions in contexts where women's agency is constrained.

Second, **ensure direct disbursement to women.** The direct effect (51.2%) suggests that direct resource control is the most powerful pathway to empowerment. Programs should maintain practices that give women control over loan funds. Joint loans or loans disbursed to male household heads may not yield the same empowerment benefits. This is consistent with the argument that women's independent access to resources is critical for shifting intra-household bargaining dynamics [13].

Third, **invest in women's leadership and group formation.** The social networks mechanism (40.2%) suggests that the social dimension of WSCCs is crucial. Programs should invest in women's groups, leadership development, and peer support networks. These investments build the social capital that empowers women. The qualitative evidence suggests that regular meetings and collective problem-solving are particularly valuable for building confidence and agency.

Fourth, **provide financial literacy training.** The financial skills mechanism (28.5%) suggests that capacity building is important. Programs should provide training on budgeting, record-keeping, and financial planning. This training builds the skills that enable women to manage resources effectively. The qualitative evidence suggests that training on separating household and business finances is particularly valuable for improving financial management and empowerment.

Fifth, **conduct community sensitization.** The qualitative findings suggest that family support matters. Programs should engage husbands and families through community sensitization, couples' training, and men's discussion groups. Building family support can enhance empowerment outcomes. The qualitative evidence suggests that husbands who see the benefits of their wives' businesses become more supportive, creating a positive feedback loop.

5.5 Limitations

Several limitations should be acknowledged. First, the cross-sectional design limits causal claims. While PSM addresses selection bias, it cannot account for unobserved heterogeneity. The Rosenbaum bounds analysis suggests robustness to moderate unobserved confounding, but this does not eliminate the possibility of omitted variable bias. Future research using longitudinal data would provide stronger causal evidence.

Second, the sample size (277 households) is modest, though power analysis indicates adequate power for the observed effects. Larger samples would enable more detailed analysis of heterogeneity, such as differences by duration of membership, type of WSCC, or geographic location.

Third, self-reported data may contain measurement error and social desirability bias, though cross-checks were used to verify key variables. Additionally, recall bias may affect the accuracy of income reporting, a common challenge in rural household surveys. Future research could use income diaries or objective asset indices as complementary measures.

Fourth, the study focuses on one zone in Ethiopia, which may not be representative of other regions. East Hararghe has specific agro-ecological, cultural, and institutional characteristics that may influence the findings. Replication in other contexts is needed to determine the generalizability of the results.

Fifth, the mediation analysis assumes that the mediators are measured without error and that the causal ordering is correct. While these assumptions are plausible, they cannot be definitively tested. Future research could use longitudinal mediation analysis or instrumental variables for mediators to strengthen causal claims.

6. Conclusion and Recommendations

6.1 Conclusion

This study examined the impact of WSCC membership on household income and women's economic empowerment in male-headed households in East Hararghe Zone, Ethiopia. The findings reveal that WSCCs deliver a dual impact, simultaneously increasing household income by 27.3% and women's economic empowerment by 0.457 points. This challenges the assumption that household income gains automatically translate to women's empowerment and demonstrates that women's independent access to resources can shift intra-household dynamics.

The empowerment effect operates through three interconnected mechanisms: direct resource control (loans disbursed directly to women), social networks (peer support, information sharing, collective action), and financial management skills (budgeting, planning, record-keeping). Social networks explain 40.2% of the empowerment effect, financial skills explain 28.5%, and direct resource control explains 51.2%. This finding demonstrates that empowerment is driven by multiple pathways operating simultaneously, with direct resource control being the most powerful driver, but social networks and financial skills playing substantial complementary roles.

The finding that empowerment increases even in male-headed households—where patriarchal norms might limit women's agency—is particularly significant. It suggests that WSCCs, by providing women with independent resources, social networks, and skills, can enhance women's bargaining power within households even when traditional power structures might resist change. These findings position WSCCs as promising dual-purpose interventions with the potential to simultaneously address poverty reduction and gender inequality in patriarchal contexts.

6.2 Recommendations

Based on the findings, the following recommendations are made:

For WSCC Management:

Ensure direct disbursement to women

Maintain practices that give women control over loan funds. Avoid joint loans or loans disbursed to male household heads. This is the single most important practice for generating empowerment effects.

Invest in women's groups

Formalize women's support groups within WSCCs. These groups provide the social networks that build confidence and agency. Regular meetings should include time for peer support and information sharing.

Provide financial literacy training

Offer training on budgeting, record-keeping, and financial planning. This training builds the skills that enable women to manage resources effectively. Training should emphasize separating household and business finances.

Support women's leadership

Encourage women to take on leadership roles in the cooperative. Leadership opportunities build confidence and agency. Provide mentorship and capacity building for women leaders.

Conduct community sensitization

Engage husbands and families through community meetings, couples' training, and men's discussion groups. Building family support can enhance empowerment outcomes.

For Government and Cooperative Agencies:

Develop dual-purpose evaluation frameworks

Evaluate WSCCs on both income and empowerment outcomes. Recognize that both are important. Require reporting on empowerment indicators alongside financial performance.

Support capacity building

Provide funding and technical assistance for women's groups, leadership development, and financial literacy training. These are cost-effective investments that yield substantial empowerment returns.

Promote gender-responsive policies

Ensure that cooperative policies address women's specific needs and constraints, including direct control over loan funds. Recognize that household headship alone does not guarantee agency.

For Development Partners:

Fund social infrastructure

Provide funding for women's groups, peer support networks, and leadership development programs. The social networks mechanism (40.2%) suggests these are high-return investments.

Support research on mechanisms

Fund research that tests mechanisms and identifies what works for empowerment. Our findings suggest that interventions combining credit, training, and social support are more effective than credit alone.

6.3 Avenues for Future Research

First, longitudinal research is needed to establish causal relationships and track how empowerment and income evolve over time. Panel data would allow researchers to observe whether WSCC membership leads to sustained improvements or whether effects diminish. This would also enable testing of reverse causality and temporal ordering.

Second, experimental studies could test different program components (e.g., training alone vs. credit alone vs. credit-plus-training) to identify the most effective approaches for generating empowerment. Randomized controlled trials would provide the strongest causal evidence.

Third, comparative studies across regions could examine how contextual factors—cultural norms, market infrastructure, social protection systems—moderate the effects of WSCC membership on empowerment. This would help identify the conditions under which WSCCs are most effective.

Fourth, mediation analysis with more detailed mechanisms (e.g., confidence, bargaining power, social status) could further disentangle the pathways through which WSCCs affect empowerment. This would provide more precise guidance for program design.

Fifth, cost-effectiveness analyses could compare the returns on investment for different interventions (WSCC expansion vs. training vs. social infrastructure) and inform resource allocation decisions. This

would help policymakers prioritize interventions with the highest empowerment returns per dollar invested.

Sixth, research on spillover effects—whether WSCC membership benefits non-members through information sharing or norm change—could reveal broader impacts not captured in individual-level analysis. This would provide a more complete picture of WSCC impacts on community welfare.

Statements and Declarations

Ethical Approval and Consent to Participate: *This study was reviewed and approved by the Institutional Research Ethics Review Committee of Haramaya University, Ethiopia. Formal administrative permission to conduct the household survey across the target districts was granted by the local zonal and district administrative offices. Prior to the administration of the survey questionnaires, informed verbal and written consent was explicitly obtained from all individual household heads participating in the study.* **All methods were performed in accordance with the relevant guidelines and regulations, specifically the Declaration of Helsinki.**

Clinical trial number: not applicable.

Consent for Publication: Not applicable. The manuscript does not contain any individual person's data.

Data Availability: The data that support the findings of this study are available from the corresponding author upon reasonable request. The data were collected through primary surveys conducted in East Hararghe Zone, Oromia Region, Ethiopia. Due to the sensitive nature of household financial information, the data are not publicly available to protect participant confidentiality. However, anonymized data can be made available to researchers who provide a methodologically sound proposal and sign a data confidentiality agreement.

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Authors' Contributions: Ibrahim Aliyi conceptualized the study, designed the methodology, conducted the data collection, performed the econometric analysis using the Propensity Score Matching model, and drafted the manuscript. Jema Haji, Fresenbet Zeleke, and Kedir Jemal supervised the research framework, reviewed the statistical results, and critically revised the manuscript for intellectual content. All authors read and approved the final manuscript.

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Figures

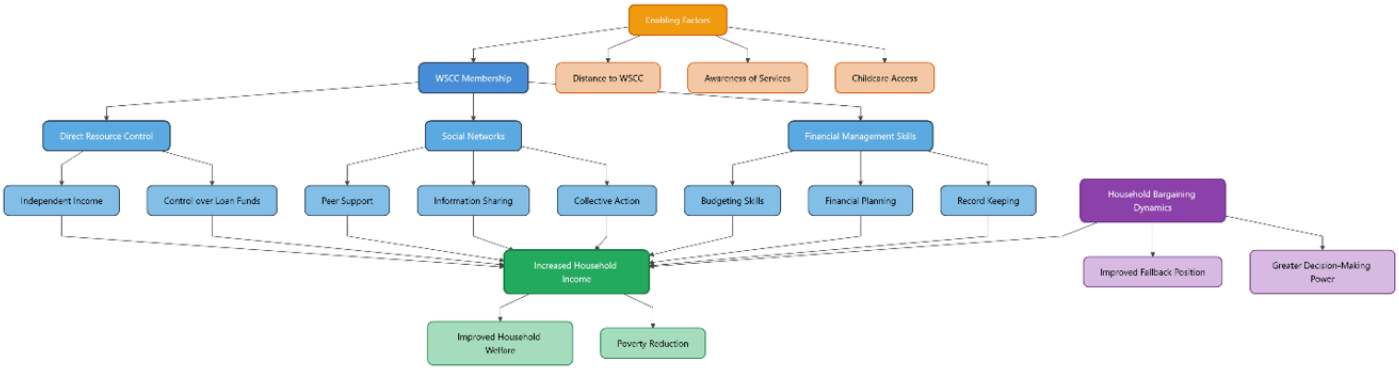

Figure 1

conceptual framework linking WSCC membership to income and women's economic empowerment in male-headed household in rural Ethiopia

Supplementary Files

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