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Rural Nonfarm Enterprise and Its Impact on Household Livelihood in Ethiopia: Evidence from Gurage Zone

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Received: 12 July 2024; Accepted: 6 August 2024; Available online: 8 August 2024

ABSTRACT: In Ethiopia, until recently, less attention has been given to rural entrepreneurship, while the rural economy has accounted for the lion's share of employment, export earnings, and national income. This study scrutinized the factors influencing rural household participation in nonfarm enterprise and its impact on household livelihood in the Gurage zone. Data was collected from 352 households using questionnaires, and Key-Informant Interviews and Focus Group Discussions were used. The factors influencing household participation in nonfarm enterprises were estimated using a logit model, while Propensity Score Matching (PSM) was employed to assess the impact on household livelihoods. Women, single-headed households, households with larger family sizes, and households with secondary and primary education are more likely to participate in nonfarm enterprises. In addition, access to extension services, training, market, transport, credit, and being a member of cooperatives have increased the probability of household participation in nonfarm enterprise. Participation in nonfarm enterprises improved the livelihood of rural households. Rural nonfarm enterprises should be integrated into national policy as a means of economic empowerment, focusing on creating employment opportunities for women and youth and reducing poverty. Rural infrastructure expansion, access to credit, and entrepreneurship training should be prioritized and the sector should be enhanced as an alternative livelihood strategy.

Keywords: Rural Nonfarm Enterprise; Livelihood; Propensity Score Matching

1. Introduction

As indicated in [1] from the 17s sustainable development goals (SDGs), the motto of goals one and two is no poverty and zero hunger, respectively. However, these goals cannot be achieved unless countries adjust their philosophy about rural development. In many developing countries, more attention has been given to urban enterprises, while rural-based enterprises have remained missing from the policy agenda. Scholars and industry practitioners have recognized the concept of rural enterprise as a key driver of socio-economic growth and wealth, particularly in developing countries [2]. Many researchers and policymakers agree on promoting rural enterprises as a vital business mechanism to improve the well-being of rural communities and their economies. For many years, more than two-thirds of the world's poor have lived in rural areas, relying on subsistence agriculture for their livelihoods. In developing countries, agriculture depends on rain, which leaves the sector subject to the vagaries of nature. Within this setting, diversifying the income sources of rural dwellers through promoting nonfarm enterprises can be one technique to escape the adverse shocks of farming activity and reduce rural poverty and unemployment as well as realize the SDGs. As indicated in [3], farming alone cannot provide adequate livelihood opportunities in rural areas, thus, nonfarm economic activities (called nonfarm enterprise hereafter) have played an important role in reducing rural poverty and increasing the income portfolio of rural societies. In addition, the [4] indicated that rural communities' economic and social problems could be addressed by stimulating and supporting nonfarm economic activities (NFEA).

Many writers understood NFEA as a diverse set of economic activities experienced by rural households for economic motives. Households in Africa have been participating in NFEA as a means of employment, poverty reduction, income diversification, emergence of rural towns, and economic growth [5,6]. Presently, the sector continues to attract attention as a development tool in rural areas and it is especially vital for helping rural areas to tackle poverty and

https://doi.org/10.35534/rrd.2024.10015

income inequality, which are the manifestations of developing countries in general and Ethiopia in particular. It is assumed that nearly 80% of Ethiopia's population depends on agriculture as the primary source of livelihood. As a result, the development of rural areas should be the focus of policymakers along with other objectives to facilitate the structural transformation and achieve its medium and long-term objectives. Due to the growing population, available land for agriculture becomes limited, which demands other sources of income and employment. As documented by [7] policymakers see NFEA as a potential alternative to agriculture for boosting rural income growth, especially among poor farming households.

After a long time of disregard, NFEA has attracted the attention of policymakers [8]. As documented in [9], in declining per capita agriculture land, rural urbanization, and economic transformation, farming is no longer the only or main source of survival and economic growth for many transitioning households. Supplementing farming with NFEA has vital implications for economic growth and employment, which serve as a pathway to poverty alleviation. About 25% of rural households in Ethiopia participate in NFEA [10]. Ref. [11] showed that the share of households involved in NFEA is 22.87% which is low compared to other African countries such as 61.73%, 52.67%, 42.24%, and 38.65% in Niger, Nigeria, Uganda, and Tanzania, respectively. Moreover, ref. [12] revealed that off-farm activities accounted for 25% of rural household income in Ethiopia. While nonfarm activities are crucial for improving the living conditions of rural households, they offer limited opportunities in Ethiopia overall and particularly in the Gurage zone. Within this background, it is fascinating to scrutinize the factors affecting household participation in nonfarm economic activities. Furthermore, as per the researchers' knowledge, prior studies in the study area provide limited evidence concerning intention to participate in NFEA, its determinants, and its impact on household livelihood outcomes. Empirical evidence about the impacts of NFEA on household livelihood outcomes was scarce in the study area.

Therefore, the study quantified the impact of participation in NFEA by using propensity score matching (PSM) which provides quantified evidence for policymakers at national, regional, or zonal levels who stand to promote the sector to reduce rural poverty, unemployment, and income inequality. The objective of the study is, therefore, to identify the factors affecting household participation in NFEA and its impact on livelihood outcomes. The study intends to sensitize government and nongovernment agencies about NFEA and its role in rural development and household livelihood strategies. Knowing the pull and push factors is vital to propose intervention strategies that aspire to women's empowerment, employment reduction, and poverty reduction. Therefore, the output of this study could point out factors that discourage or boost the development of NFEA and its impact on household livelihood. It also contributes to the body of knowledge in the literature regarding rural nonfarm economic activities. The rest of the study is organized as follows. Section two presented literature reviews, the third section presented materials and methods, the fourth section introduced the analysis and discussion, and the final section discussed the study's conclusions.

2. Empirical Literature

Ref. [13] showed that households with little assets, education, and infrastructure are constrained to participate in NFEA. Ref. [14] also exhibited that age, household size, primary occupation, farm income, farming experience, membership to cooperatives, and access to credit significantly affect women farmers to partake in nonfarm enterprise. Married households and households with better education, large family size, and high annual income, land, livestock, access to irrigation, and credit, female and young, are more likely to partake in NFEA [15,16]. In addition, ref. [17] found that factors such as a decline in land size, proximity to resort areas, higher levels of education, and access to infrastructure positively influence households' participation in rural nonfarm enterprises. As documented in [18,19] sex, age, household size, education, health and marital status of the household, total income and membership in cooperatives, infrastructures, and closeness to market have significant effects on household participation in rural NEFA.

The empirical evidence of [20] indicated that income from nonfarm activities cut household poverty incidence from 68.9% to 10.9% in China. Besides, the depth of poverty declined from 39.2% to 2.9%, and the severity of poverty from 26.3% to 1.2%. Moreover, ref. [17] showed that rural NFEA is important for poor households and contributes 50% of total income. Another study by [21] showed that total rural NFEA income increases income inequality in rural Ghana. At the disaggregate level, it reduces income inequality while nonfarm wage income increases income inequality. In addition, ref. [22] revealed that rural NFEA positively affects farm household income and consumption expenditure in rural India. As documented in [23], participation in rural positively affects household well-being in Nigeria. Lastly, ref. [24] also indicated that participation in nonfarm employment improves household consumption expenditure and reduces poverty.

In a nutshell, the determinants of household participation in rural NFEA are grouped as household-specific characteristics, asset holding, infrastructures and credit, inputs, external support, training and remittances, and social

capital, and mixed results exist. In the literature, empirical studies exist about the impact of rural NFEA on the household economy. Still, the methodology used is questionable as many empirical works do not account for the treatment and control groups. Cognizance of the importance of rural NFEA, a context-specific study, is vital to identifying factors influencing the sector. Similarly, quantifying the impact of participation in rural NFEA on the household economy using appropriate methods is of vital importance to knowing its impact and designing appropriate policy and strategy.

3. Materials and Methods

The target population of the study is households living in rural areas of the Gurage zone, located in northern parts of SNNPRS of Ethiopia.[1] Data were collected from primary and secondary sources. The former includes data collected from sample households, interviews, and focus group discussions (FGD), while the latter was collected from national, regional, zonal, and Woreda reports. The study employed probability and non-probability sampling techniques. Data collected through questionnaires employed stage sampling. In the first stage, three Woredas were randomly selected: Ezha, Cheha, and Gummer. In the second stage, sample households were selected randomly from the three Woredas. According to the [25], there are 20,376, 14,660, and 14,323 households in Cheha, Ezha, and Gummer Woredas, respectively, which gives a total of 49,359 households. To decide on sample size, ref. [26], the formula is adapted and written as Equation (1).

$$n = \frac{N}{1 + N(e)^2} \tag{1}$$

$$n = \frac{49{,}359}{1+49{,}359(0.05)^2} = \approx 400$$

where *n*, *N*, and *e* represent the sample size, target population, and confidence level at 95%, respectively. Once the sample size is determined, it is proportionately distributed into the three Woreda, as shown in Table 1 and respondents were selected randomly to collect the data. Besides, key informant interviews, FGD, and document reviews were used. The key informant interview targeted nine purposively selected rural development offices since they are deemed the focal persons with rich information about NFEA. Similarly, FGD with households in six sessions was undertaken in three Woredas.

Table 1. Proportional Sample Distribution.

No.	Name of Woredas	Number of Households	Sample Taken
1	Cheha	20,376	(20,376/49,359) × 400 = 165
2	Ezha	14,660	(14,660/49,359) × 400 = 119
3	Gummer	14,323	(14,323/49,359) × 400 = 116
	Total	49,359	**400**

The base to develop the empirical model is [27–29] theory of the farm household. Households allocate time to farm work up to the point where the marginal rate of substitution between home time and consumption ($\frac{\gamma}{\lambda}$) is equal to the marginal value of farm labour. Where λ and γ are Lagrange multipliers for marginal utility of income and labour time. Nonfarm work becomes zero ($T_n = 0$) if the marginal return to nonfarm labour (W_n) is less than the marginal rate of substitution between home-time and consumption goods [W_n (H_n, Z_n)$\leq \gamma/\lambda$]. Assuming the interior solution ($T_n > 0$), W_n equals the marginal value of farm labour written as Equation (2).

$$(\gamma/\lambda) = W_n (H_n, Z_n) \tag{2}$$

The decision to work nonfarm is expressed using the following participation rule (3).

$$D = \begin{cases} 1 \; if \; W_n(H_n, Z_n) > \gamma/\lambda/_{T_n=0} \\ 0 \; if \; W_n(H_n, Z_n) \leq \gamma/\lambda/_{T_n=0} \end{cases} \tag{3}$$

where Z_n is market conditions that affect nonfarm wages and H_n is a vector of human capital affecting nonfarm wages. Equation (4) shows household work on nonfarm (D = 1) if W_n is greater than the marginal value of farm labour while household does not work nonfarm (D = 0) if W_n is less than the marginal value of farm labour. Thus, the binary decision is a function of exogenous variables since the optimal nonfarm work hours are jointly determined with farm labour allocation modelled by the probability models. A binary logistic model was used to identify the determinants of

participation in NFEA because the dependent variable is binary. Therefore, the household has two choices either to participate or not participate in RNFEA. Households who participate in NFEA are denoted by 1 and 0 otherwise. As of [30], the logistic model is specified as Equation (4).

$$\frac{p_i}{1-p_i} = \frac{1 + exp\ (z_i)}{1 + exp\ (-z_i)} \tag{4}$$

Taking the natural logarithm of (5), it becomes linear as Equation (5).

$$L_i = \ln\left[\frac{z_i}{(1-p_i)}\right] z_i = \beta_o + \beta_1 X_{i1} + \cdots + \beta_n X_{in} + \mu i \tag{5}$$

P_i is the probability that the household is involved in RNFEA, and $(1 - P_i)$ is the probability of not being involved in NFEA. L_i is Logit, X_i is a vector of explanatory variables and $\beta_o \ldots \beta_n$ is a vector of parameters, and μi, is an error term.

The impact of NFEA on household livelihood outcomes is shown by using PSM. Income and expenditure are proxies of livelihood. Ref. [23] used consumption, income, and food shortage as well-being indicators and [22] used income and expenditure to measure the impact of off-farm enterprises. Ref. [31] showed PSM constructs statistical comparison groups based on the probability of participation in treatment conditional on observed characteristics. There are two assumptions of PSM, conditional independence and common support assumption. The former assumes matching methods can used only to construct observed characteristics of the comparison group. The latter assumes the treatment units must be comparable to non-treatment units in terms of observed characteristics. The parameter of interest in propensity score is the Average Treatment effect on the treated (ATT) because it the participation impact on household livelihood outcome. The nearest neighbor, caliper, radius, and kernel matching were employed to estimate the impact of participation on household livelihood outcomes. The propensity score P(Z_i) is defined as the conditional probability of participation in RNFEA given pre-participation characteristics as Equation (6).

$$P(Z_i) = \Pr[L_i = |Z_i] = E[L_i|Z_i]; P(Z_i) = F\{h(Z_i)\} \tag{6}$$

where $L_i = (0, 1)$ is participation, Z_i is a vector of pre-participation observed characteristics, and $F\{h(Z_i)\}$ is logistic cumulative distribution. The propensity score $P(Z_i)$ estimates ATT as Equation (7).

$$\text{ATT} = E[E\{Y_i^*|L_i = 1, P(Z_i)\} - E\{Y_i|L_i = 0, P(Z_i)\}|L_i = 1] \tag{7}$$

Y^* and Y_i are two counterfactual outcomes for participants and non-participants. Using a suitable algorithm, the impact of participation on household livelihood outcomes is estimated by considering other covariates. The covariates are those assumed to affect the income and expenditure of households based on empirical evidence. The description and lable of variables are presented in Table 2.

Table 2. Description of Variables.

Variables	Description
Participation in NFEA	Dummy (1 = participant, 0 otherwise)
Sex	Dummy ((1 = male, 0 for female)
Age [2]	categorical
Marital status	Dummy (1 = married, 0 for single)
Education [3]	categorical
Family size	Discrete (numbers)
Farmland size	Continuous (hectare)
Proximity to city	Continuous (kilometer)
Livestock holding	Discrete (number)
Extension service	Dummy (1 = yes, 0 otherwise)
Access to credit	Dummy (1 = yes, 0 otherwise)
Access to market	Dummy (1 = yes, 0 otherwise)
Access to electricity	Dummy (1 = yes, 0 otherwise)
Access to transport	Dummy (1 = yes, 0 otherwise)
Access to training	Dummy (1 = yes, 0 otherwise)
Total income	Continuous (birr)
Access to improved seed	Dummy (1 = yes, 0 otherwise)
Access to fertilizer	Dummy (1 = yes, 0 otherwise)
Family remittance	Dummy (1 = yes, 0 otherwise)
Membership to cooperatives	Dummy (1 = yes, 0 otherwise)
Total expenditure	Continuous (birr)

4. Analysis and Discussion

4.1. Descriptive Analysis

From the total 400 questionnaires distributed, only 352 (88%) were filled appropriately and returned, whereas the remaining 12% were lost and filled inappropriately. Table 3 shows 59.77% of the respondents were male, while 40.23% were female. The prime and mature working age groups accounted for 78.18% and 16.15% of total respondents, respectively, while early working age accounted for 5.67%. The result indicated that most respondents are at their mid-year of active working age. Respondents with no education accounted for 40.51%, while 36.26% and 23.23% of respondents have attained primary and secondary education, respectively. The majority (41.64%) of the respondents were located in Cheha Woreda, while 29.46% and 28.90% were residents of Ezha and Gummer Woreda, respectively. Most (83.85%) respondents were married, while 16.15% were single-headed households. The average family size is 3.83, per household, which is less than the national average household size of 4.8.

Table 3. The Frequency of Demographics Variables of Household.

Variables		Frequency	Percentage (%)
Sex	Male	211	59.77
	Female	142	40.23
Age	Early working age (15–24) years	20	5.67
	Prime working age (25–54) years	276	78.18
	Mature working age (55–64) years	57	16.15
Education	No-education (Illiterate)	143	40.51
	Primary Education (Grade1–8)	128	36.26
	Secondary Education (Grade 9–12)	82	23.23
Woreda	Ezha	104	29.46
	Cheha	147	41.64
	Gummer	102	28.90
Marital Status	Married	249	83.85
	Single	57	16.15
Family Size	Mean = 3.832	Sd = 0.079	

Of 352 respondents, 194 respondents were participants in NFEA, while 158 were nonparticipants. From respondents of NFEA, it is expected that none of them will be involved over the year. 87.63% of respondents participated in all seasons. On the other hand, 10.31%, 1.55%, and 0.52% of the respondents participated in autumn, winter, and during both spring and winter, respectively. Alike agriculture, NFEA is not subject to the vagaries of natural dependence, so households participated in the sector over the year. Additionally, there is less risk in NFEA compared to the agriculture sector. However, the result contrasts with WB (2009), who shows that NFEA in Ethiopia is seasonal and complementary to agriculture. This could be due to variations in household response to incentives and risk behavior in different areas of Ethiopia.

RNFEA comprises a diverse set of economic activities. As shown in Table 4, most of the respondents were involved only in trade and handcraft activities, which accounted for 24.74% and 15.46%, respectively. However, 59.8% of respondents have participated in more than one set of activities. For instance, 9.79% have been involved in trade and wage work concurrently, while 9.28% have been involved in trade, handcraft activities, street trade, and vegetables. In addition, information from focus group discussants shows various arrays of traded items such as chat, livestock, vegetables, fruits, cereals, and consumer goods. Households participated in handcrafts such as masonry, tannery, pottery, blacksmiths, weaving, decoration, etc. Selling beverages, food, and beauty salons is another NFEA practiced by households.

Table 4. Types of Nonfarm Economic Activities.

Activity Types	Frequency	Percentage
Trade	48	24.74
Handcrafts activity	30	15.46
Trade and woodwork	19	9.79
Trade and handicrafts	9	4.64
Trade, wage work, street vendor, and vegetables	18	9. 28
Trade, family business, woodwork, and street vendor	11	5.67
Trade, woodwork, street trade, clothing and vegetables	10	5.16
Handcrafts, woodwork, cloth, street trade, and stone	8	4.13
Trade, wage work, vegetable and cloth	11	5.67
Handcrafts, trade, cloth, and family business	3	1.55
Trade, handcrafts, cloth, and vegetable	7	3.61
Trade, family business, vegetable, wage work, and pity trade	6	3.09
Trade, handcrafts, vegetable, and street trade	7	3.61
Handcrafts, trade, wood & wage work, pity trade, and vegetable	3	1.55
Trade, handcrafts, wag work, woodwork, vegetable, stonework	4	2.06
Total	**193**	**100**

Households in the study area have experienced mixed farming systems, such as crop production and livestock rearing. Households also participated in NFEA in addition to farming to enhance farm income for various motives such as consumption, saving, purchase of agricultural inputs, or combinations of all. 39.9% of the respondents participated in NFEA for both consumption and saving motives. Respondents also participated in saving and house-building motives which accounted for 4.66% and 4.15%, respectively. Even if its share is trivial (1.04%), respondents have been involved in NFEA to cover the education spending of families. In addition, 17.10% of the respondents participated for the consumption motive while 33.16% participated in NFEA, which was driven by the combinations of all motives. In addition, information collected from key informants' interviews indicated that households have participated in NFEA for various motives such as credit payment and purchase of farming inputs. One of the focus group discussants explained that*:*

"I have participated in selling vegetables and fruits at the nearest markets almost every day, and then the income obtained is used to cover family consumption expenditures such as food, clothes, and student expenses".

As indicated at the beginning of this section, 158 of the respondents did not participate in NFEA. Respondents were asked why they did not participate. Consequently, 30% of the respondents did not participate because income from agriculture was sufficient and 29.38% responded that due to the absence of a market and infrastructure. In addition, lack of government support and market access accounted for 12.50% of the factors that contributed to the nonparticipation of households in NFEA. In comparison, 8.13% responded that there is a lack of infrastructure, although agricultural income is adequate. Moreover, 32% have not participated due to a combination of the above factors. The key informant interviewee was also asked about and responded that households have not participated in NFEA due to a lack of government support and infrastructure. Further, it explained that government support in the form of credit and technical advice is minimal and infrastructures such as electricity, market linkage, and transport are another challenge. Lack of interest in engaging is another factor that hinders participation.

Land and livestock are the two most vital inputs in farming activity. The average landholding in the study area is 0.615 hectares, less than the national holding because Gurage zone is the most dense area. The maximum landholding is 1.5 hectares, whereas the minimum is zero. Livestock is a vital asset in the household economy, as well as farming or a means of livelihood. The main livestock assets include oxen, sheep, goats and pack animals. The average livestock per household is 3.584, and the maximum and minimum are 9 and zero, respectively.

As shown in Table 5, 81.59% of the respondents have no access to improved seeds, while 18.41% have access to improved seeds. Moreover, 44.76% of respondents have access to fertilizer, while 55.24% have no access to fertilizer. About credit, 83% of respondents have no access to credit, while 17% have access to credit. Therefore, the results suggested that households have limited access to improved seeds, fertilizer, and credit. In addition, 13.88% of respondents have access to electricity, while the majority (86.12%) have no access to electricity. Besides, 40.79% of the respondents have access to transport services, while 59.21% have not. Concerning the market, 36.26% of the respondents have access to the market, while 63.74% have no access to the market. Similarly, 44.48% of respondents have access to extension services, whereas the rest (55.52%) have no access. Only 23.86% of respondents have access

to training, however, 76.14% have no access to training. Regarding remittances, 62.04% of respondents reported not receiving any, while 37.96% stated they had received remittances from either overseas or domestic sources. Regarding social capital, 38.81% of respondents were members of associations, while 61.81% were not members. The participation rate of households in NFEA is 54.96%, while 45.04% were nonparticipants. The average distance to the nearest city is 6.15 km, with the maximum distance being 14 km and the minimum distance being 0.5 km.

Table 5. Descriptive Statistics of Variables.

Variables	Yes		No	
	Frequency	Percentage	Frequency	Percentage
Do you have access to improved seeds	65	18.41	288	81.59
Do you have access to fertilizer	158	44.76	195	55.24
Do you have received remittances	134	37.96	219	62.04
Do you have credit access	60	17	293	83
Do you have access to electricity	49	13.88	304	86.12
Do you have access to transport	144	40.79	209	59.21
Do you have access to the market	128	36.26	225	63.74
Do you have access to the extension	157	44.48	196	55.52
Do you have access to training	84	23.86	268	76.14
Are you a member of a cooperative	137	38.81	216	61.19
Are you participating in NFEA	194	54.957	159	45.042
Distance from nearest city, mean = 6.52, S.D = 3.1, Minimum = 0.5 and Maximum = 14				

4.2. Empirical Analysis of Participation in Nonfarm Economic Activities

In the logistic regression model, the assumptions of the classical linear regression model (CLRM), such as linearity, normality, homoscedasticity, and autocorrelation, need not be satisfied [32].

However, independent variables should not be collinear. To confirm this, a multicollinearity test was conducted using both correlation analysis and the Variance Inflation Factor (VIF). Although there is no clear cutoff value, ref. [33–35] exhibited that a VIF less than 10 suggests that the relationship between predictor variables is weak and the smaller the VIF, the lesser multicollinearity problems.

The results showed that the VIF for the predictor variable "age" is close to 1, indicating a low level of association between the variables. The mean VIF is 1.56, indicating that there is no multicollinearity problem among the variables.

The overall evaluation of the logit model is checked by using various techniques. One is the likelihood ratio (LR) test, which shows how well the independent variables jointly affect the dependent variable. The null hypothesis stated that independent variables do not jointly affect dependent variables. As shown in Table 6, LR with degree of freedom 20, LR (20) = 226.88 is the likelihood ratio chi-square statistic, and probability (prob) > LR = 0.0000 is the p-value. Thus, independent variables fit well in the model and have a high effect on jointly predicting the dependent variable. Another measure of goodness of fit is the Pearson or Hosmer-Lemeshow goodness of fit test, and the null hypothesis assumes that the model fits the data well. Hosmer-Lemeshow test statistics (19.03) are insignificant at (prob. > 0.05), so we accept the null hypothesis, suggesting that the model well fits the data.

Table 6. Overall Model Evaluation and Goodness of Fit Test.

Test	Categories	χ^2	df	Prob.
Overall model evaluation	Likelihood ratio test	226.88	20	0.000
Goodness-of-fit test	Hosmer-Lemeshow	19.03	20	0.5197

Various variables, such as demographic features of households, economic and infrastructure, and government-related variables, are included in the regression model. Accordingly, the logit model estimate, odd ratio, and marginal effect are reported in Table 7, along with their robust standard errors. Six variables—access to electricity, remittances, fertilizer, improved seeds, age (25–54 years), and distance—are statistically insignificant, while the remaining 14 variables are significant.

Household Size: Households with larger family sizes are more likely to participate in NFEA than households with less family size. Citrus paribus, as household size increases by one person, the odd ratio in favour of participation in NFEA increases by a factor of 2.27. Because households with larger family sizes have high expenditures thus, the probability of participation in income-generating activities to diversify and increase income sources is higher than relying on agriculture income only. There may also be surplus labour in the household that increases the probability of

participation. The result is consistent with the findings of [16,18,19,36,37] that showed that households with large family sizes are more likely to participate in NFEA than households with less family size.

Sex of household head: It is expected that females are more likely to participate in non-farm employment activities (NFEA) than males. Consistently, the result indicated that citrus paribus, the odd ratio in favour of participation in NFEA decreases by a factor of 0.535 as a household is male. This is because males participate in farm activity, which is assumed to be more productive. In contrast, females participate in NFEA, which is assumed to be non-productive and requires less energy. The result is in line with the findings of [13,16,18,37,38] that women are more likely to participate in nonfarm economic activities than males.

Table 7. Determinants of Participation in Nonfarm Activities: Logit Estimates.

Participation (Dependent Variable)	Coefficient	Odd Ratio	Marginal Effect
Family size	0.820 *	2.270 *	0.095 *
	(0.152)	(0.345)	(0.015)
sex (dummy)	−0.625 ***	0.535 ***	−0.073 ***
	(0.366)	(0.196)	(0.042)
Marital status (dummy)	−2.567 *	0.077 *	−0.298 *
	(0.644)	(0.049)	(0.069)
Age (55–64) years	−2.340 **	0.096 **	−0.272 **
	(1.00)	(0.096)	(0.111)
Age (25–54) years	−0.675	0.509	−0.078
	(0.820)	(0.418)	(0.094)
Education (9–12 grade)	0.857 **	2.355 **	0.100 **
	(0.448)	(1.055)	(0.051)
Education (1–8 grade)	0.871 **	2.390 **	0.101 **
	(0.351)	(0.839)	(0.039)
Membership to cooperatives	1.688 *	5.409 *	0.196 *
	(0.370)	(2.00)	(0.036)
Training access	0.792 ***	2.207 ***	0.092 ***
	(0.409)	(0.903)	(0.064)
Extension service	1.049 **	2.855 ***	0.122 ***
	(0.317)	(0.905)	(0.034)
Market access	2.493 *	12.099 *	0.290 *
	(0.427)	(5.17)	(0.036)
Transport access	0.985 **	2.679 **	0.114 **
	(0.355)	(0.953)	(0.038)
Electricity access	0.456	1.578	0.053
	(0.493)	(0.778)	(0.057)
Credit access	0.957 **	2.603 **	0.111 **
	(0.505)	(1.314)	(0.058)
Remittance	−0.125	0.883	−0.014
	(0.348)	(0.307)	(0.040)
Access to fertilizer	−0.180	0.835	−0.021
	(0.323)	(0.270)	(0.037)
Access to improved seeds	−0.255	0.775	−0.030
	(0.441)	(0.341)	(0.051)
Distance (KM)	0.017	1.017	0.002
	(0.059)	(0.061)	(0.007)
Livestock holding	−0.205 **	0.814 **	−0.024 **
	(0.105)	(0.085)	(0.012)
Land area	−3.721 *	0.024 *	−0.432 *
	(0.803)	(0.019)	(0.085)
Constant	0.514	1.672	
	(0.965)	(1.614)	

Where, *, **, and *** is significance level at 1%, 5% and 10%, respectively. Robust standard errors are reported in parenthesis. Number of observations = 352, LR Chi2 (20) = 226.88, Prob > Chi2 = 0.000, and Pseudo R^2 = 0.4685.

Marital Status of household: A single-headed household is more likely to engage in NFEA than a married household. Citrus paribus, the odd ratio in favour of participation in NFEA decreases by 0.077 as the household head is married. Single-headed households are mostly assumed younger and have no access to land and other assets; hence,

they are obligated to participate in nonfarm activities. The result aligns with the findings of [38], who demonstrated that married households are less likely to participate in NFEA compared to single-headed households.

Age of household: It is expected that as the age of a household increases, the probability of participating in non-farm employment activities (NFEA) decreases, as older households typically have less incentive to engage in this sector. As expected, mature working-age households are less likely to participate in NFEA than other age groups. Citrus paribus, the odd ratio in favour of participation in NFEA decreased by 0.096 for the mature working age group. The finding is consistent with the findings of [18,37,38] that young-age households have higher incentives to participate in NFEA than old-age households.

Education level of household: Households in the upper secondary and primary education are more likely to participate in NFEA than those without education. Other things were constant, as such the odd ratio in favour of participation in NFEA increased by 2.39 and 2.355 as households attained primary and secondary education, respectively. Education increases the awareness of individuals to explore the opportunities obtained from NFEA, and the result is analogous to the findings of [35,37,38].

Cooperative membership: Households that are members of cooperatives are more likely to participate in NFEA than those who are not members of any association or cooperative. All else being equal, the odds of participating in NFEA increase by a factor of 5.409 for households that are members of cooperatives. Being a member of associations increases the social networks and sharing of experiences about starting a business, which in turn increases participation in NFEA. The result is consistent with the findings of [18,19,38–40]. Being a member of a cooperative lessens financial constraints through informal financial institutions such as Equib and Edir [4]; it increases entrepreneurial skill, social capital, and bargaining power in the selling and buying process and other shared actions [18,38]. An association can be transformed into market information, business opportunities, resources, skills, and knowledge sharing about the importance of NFEA [19,40].

Access to extension service and training: Access to extension services increases the probability of household participation in NFEA. Citrus paribus, the odd ratio in favour of participation in NFEA increases by 2.855 as households have access to extension services. Rural extension workers with development agents increase households' awareness about the importance of NFEA in enhancing income in addition to agriculture production support. Similarly, households with access to training are more likely to participate in NFEA than those without access to training. Citrus paribus, the odd ratio in favor of participation in NFEA increases by 2.207 as households have access to training. Training increases awareness about the diversification of income sources such as by being involved and rural entrepreneurship. The finding is consistent with [3,38], who state that training provides individuals with special and business skills to participate in NFEA.

Access to market and transport: Households with market access are more likely to engage in NFEA than those without market access. Citrus paribus, the odd ratio in favour of participation in NFEA rises by 12.099 as households have access to the market. The finding is consistent with the findings of [18,39,41]. Similarly, households with access to transportation are more likely to engage in NFEA than those without transportation access. Citrus paribus, the odd ratio in favour of participation in nonfarm economic activities, increases by 2.679 as households have access to transport. Access to transport connects output and input markets, which, in turn, facilitates transactions.

Access to credit: Households with access to credit are more likely to participate in NFEA than those without access to credit. Citrus paribus, the odd ratio in favour of participation in NFEA increases by a factor of 2.603 for households with access to credit because it helps to finance inputs. Therefore, the finding is consistent with [18,36], who indicated that households with access to credit are more likely to participate in nonfarm economic activities.

Livestock and landholding: Households who have more livestock units are less likely to participate in NFEA than those who have less or no livestock holding. Citrus paribus, the odd ratio in favour of participation in NFEA declined by a factor of 0.814 as livestock holding of households increased by one unit. Similarly, households who have more land are less likely to participate in NFEA than those who have less or no landholding. Citrus paribus, the odd ratio in favour of participation in NFEA decreases by 0.024 as landholding increases by one hectare. The finding concerning landholding is consistent with [16,41], who showed that small land-holding households are more likely to participate in NFEA than those with more land.

4.3. Nonfarm Economic Activities and Household Livelihood

In addition to crop and livestock, off-farm and nonfarm income is a vital source of income for households in Meskan and Mareko Woredas of the Gurage zone [42]. As shown in Table 8, the household average yearly income from farm and nonfarm income was 38,188.16 ETB, while the maximum and minimum income were 98,000 and 20,000

ETB, respectively. Similarly, the average expenditure from farm and nonfarm income was 35,228.5 ETB, and the minimum and maximum expenditure were 21,000 and 82,000 ETB, respectively. Average expenditure is less than income, which shows the existence of income left from expenditure, either saved or invested. However, only marketed expenditure and income are measured, while home consumption expenditure is not taken into account.

Table 8. Household Income and Expenditure Profiles.

Variable	Mean	Std. Deviation	Minimum	Maximum
Total income	38,188.16	14,875.17	20,000	98,000
Total Expenditure	35,228.5	11,805.86	21,500	82,000

The *t*-test is used to compare the mean income and expenditure difference between treatment and control groups and is presented in Table 9. T-test is employed to check whether the mean of treatment and control group are equal or not. The null hypothesis assumes that the mean income and expenditure of the treatment and control groups are equal. the null hypothesis is rejected, which indicates the presence of a difference in the mean income of participants and nonparticipants. Therefore, the mean income of nonparticipants is less than that of participants by 10,085.06 ETB. This is due to the additional income from NFEA, with farm income contributing to the difference for treatment and control groups. Concerning expenditure, the null hypothesis is rejected, signifying that the mean expenditure of participants is higher than nonparticipants by 7682.68 ETB. Those who participated in nonfarm income-generating activities have higher incomes, leading to higher expenditures.

Table 9. The *t*-test of income and Expenditure.

The *t*-Test of Total Expenditure						
Group	**obs**	**Mean**	**Std. Err**	**Std. Dev.**	**95%**	**Conf. Interval**
Nonparticipant	159	32,645.66	778.2912	9813.878	31,108.46	34,182.86
Participant	194	42,730.72	1198.507	16,693.28	40,366.87	45,094.58
Combined	353	38,188.16	791.7255	14,875.17	36,631.05	39,745.27
Difference		−10,085.06	1499.886		−13,034.95	−7135.168
diff = mean(0) − mean(1), t = −6.7239						
Ho: diff = 0, degrees of freedom = 351						
Ha: diff < 0, Ha: diff ! = 0, Ha: diff > 0						
Pr(T < t) = 0.0000, Pr(|T| > |t|) = 0.0000, Pr(T > t) = 1.0000						
The *t*-Test of Total Expenditure						
Group	**obs**	**Mean**	**Std. Err**	**Std. Dev.**	**95%**	**Conf. Interval**
Nonparticipant	159	31,006.29	627.7698	7915.876	29,766.39	32,246.19
Participant	194	38,688.97	952.9711	13,273.35	36,809.39	40,568.54
Combined	353	35,228.5	628.3626	11,805.86	33,992.68	36,464.32
Difference		−7682.68	1196.421		−10,035.74	−5329.623
diff = mean(0) − mean(1), t = −6.4214						
Ho: diff = 0, degrees of freedom = 351						
Ha: diff < 0, Ha: diff ! = 0, Ha: diff > 0						
Pr(T < t) = 0.0000, Pr(|T| > |t|) = 0.0000, Pr(T > t) = 1.0000						

According to [43], before the propensity score, first, an outcome analysis must be undertaken. Outcome analysis is vital to measure the effect of participation if there are no propensity scores to control selection biases related to group assignment. For income analysis, all variables discussed in logistic regression were included as covariates. As shown in Table 10, participation in NFEA has a positive effect on income, which is consistent with [36,44]. Other covariates such as land, age (55–64 years) and (25–54 years), education (grade 9–12), and access to electricity positively influence income, but others are insignificant. Variables that are assumed to affect household expenditure are included as covariates. Demographic characteristics and economic variables are included, as shown in Table 11. Participation in NFEA positively affects expenditure and other covariates such as sex and education influence expenditure.

Table 10. Outcome Analysis of Income.

Total Income (Outcome)	Coefficient	Std. Err.	*t*-Value	P > t
Participation	11,800.82 *	2014.136	5.86	0.000
Family size	376.6029	625.9496	0.60	0.548
Land area	11,901.94 *	3492.237	3.41	0.001
Livestock	233.106	480.2516	0.49	0.628
Distance	−246.0294	252.1781	−0.98	0.330
Sex	1403.372	1568.118	0.89	0.371
Improved seed	−834.9819	1926.852	−0.43	0.665
Fertilizer	−1123.68	1501.923	−0.75	0.455
Remittance	−1394.988	1535.963	−0.91	0.364
Credit	785.7798	2066.601	0.38	0.704
Electricity	4300.814 *	2197.622	1.96	0.051
Transport	−1484.832	1619.819	−0.92	0.360
Market	990.7292	1774.617	0.56	0.577
Extension	−1834.025	1632.212	−1.12	0.262
Training	1164.939	1918.197	0.61	0.544
Cooperatives	−1128.633	1694.306	−0.67	0.506
Marital status	1759.251	2730.027	0.64	0.520
Education (grades 1–8)	657.4518	1741.903	0.38	0.706
Education (grade 9–12)	3939.004 *	1940.222	2.03	0.043
Age (25–54 years)	7161.522 *	3844.126	1.86	0.063
Age (55–64 years)	7469.77 *	4248.412	1.76	0.080
Constant	15,200.45 *	4499.103	3.38	0.001
obs = 352, F(21, 330) = 4.21, Prob > F = 0.0000, R-squared = 0.2113, Adj R-squared = 0.1611, * denotes significant at 1%				

Table 11. Outcome Analysis of Expenditure.

Total Expenditure (Outcome Variable)	Coefficient	Std. Err.	*t*-Value	P > t
Participation	7636.496 *	1296.928	5.89	0.000
Family size	306.0693	496.1427	0.62	0.538
Livestock	−136.4551	377.6143	−0.36	0.718
Sex	2134.407 *	1249.076	1.71	0.088
Remittance	301.0083	1225.819	0.25	0.806
Credit	1513.146	1612.88	0.94	0.349
Marital	1998.352	2178.552	0.92	0.360
Education (1–8 grade)	1476.865	1371.165	1.08	0.282
Education (9–12 grade)	3223.455 *	1553.419	2.08	0.039
Age (25–54 years)	5364.012 *	3057.885	1.75	0.080
Age (55–64 years)	4763.08	3355.611	1.42	0.157
Constant	20,777.23 *	3330.418	6.24	0.000
obs = 353, F(11, 341) = 5.42, Prob > F = 0.0000, R-squared = 0.1488, Adj R-squared = 0.1213, * denotes significant at 1%				

After outcome analysis, the next step of PSM [5] is a balance test of covariates. The balancing test shows where the distribution of observed characteristics of treatment and control groups overlap. Using the propensity score algorithm, the balancing assumption is satisfied for the covariates of income and expenditure. The next step is to estimate the effects of participation in NFEA on livelihood outcomes using nearest-neighborhood, stratification, radius, and kernel matching methods. As presented in Table 12, the output of the four PSM techniques revealed participation in NFEA has a positive impact on household income. Nearest-neighbour matching indicated ATT is 11,423 ETB per year. In the same way, the stratification (interval) matching revealed ATT is 8308.1 ETB per year. The radius (calliper) matching also indicated ATT is 10,688.5 ETB per year and using the kernel (local linear) matching the ATT is 8438.4 ETB per year. Therefore, an estimate of ATT using the four matching exhibited households participating in NFEA have on average, more income than nonparticipants. However, the ATT estimated by nearest neighbours is higher than that of another matching. In contrast, ATT estimated by stratification matching is smaller than other techniques. The result is consistent with [23] who revealed that participation in NFEA has a positive effect on the well-being of households in rural Nigeria. Ref. [45] also showed participation in nonfarm employment increased household income in the upper east and west regions of Ghana.

Table 12. AAT on Household Income.

Matching Methods	No. of Treated	No. of Control	ATT	Std. Err	t-Statistics
Nearest-neighbor	194	60	11,423 *	3050.61	3.77
Stratification	153	142	8308.1 *	4169.68	1.99
Radius	153	142	10,688.5 *	1863.77	5.74
Kernel	194	159	8438.4 *	4158.99	2.03

Where * denotes significant at 1%.

As presented in Table 13, the estimation output of the four-matching showed participation in NFEA has a positive impact on household expenditure. The nearest neighbor matching indicated ATT is 9075.07 ETB per year. In the same way, stratification matching revealed ATT is 9207.1 ETB per year. The radius matching also indicated ATT is 7956.5 ETB per year. Finally, kernel matching showed ATT is 9095.70 ETB per year. Thus, an estimate of ATT in the four matchings exhibited households participating in NFEA have, on average, more expenditure than nonparticipants but ATT estimated by stratification is higher than others. ATT is estimated by using a radius that is smaller than other techniques. The result is like the findings of [24], who indicated participation in NFEA increases expenditure and reduces the poverty status of households in Pakistan. Moreover, ref. [23] showed participation in NFEA has a positive effect on well-being by increasing consumption expenditure. In addition, ref. [22] exhibited that NFEA diversification has a positive impact on the consumption expenditure of farm households.

Table 13. ATT on household Expenditure.

Matching Method	No. of Treated	No. of Control	ATT	Std. Err	t-Statistics
Nearest-Neighbor	194	129	9075.07 *	1939.98	4.68
Stratification	75	59	9207.1 *	1870.93	4.92
Radius	75	55	7956.5 *	2041.06	3.90
Kernel	194	159	9095.70 *	2062.27	4.41

Where * denotes significant at 1%

If the result of the different matching methods is comparable, then the estimated ATT is robust. In this study, the findings of the different matching are quite consistent for both income and expenditure, such that ATT is robust. Another method is applying direct nearest neighbors matching instead of estimating propensity score [30]. If both methods give comparable results, then ATT is assumed to be more reliable and robust. Thus, the nearest neighbour matching result estimated before running the propensity score is presented in Table 14. The ATT of both income and expenditure is statistically significant suggesting that participation in nonfarm economic activities has a positive effect on household livelihood outcomes. Thus, the estimated result by propensity score and nearest-neighbors matching methods are similar, which indicates that the ATT is robust.

Table 14. Nearest-Neighbour Matching.

Total Income	Coef.	AI Robust Std. Err.	z	P > z	[95% Conf. Interval]	
ATE Participation	9241.818	1583.49	5.84	0.000	6138.235	12,345.4
Treatment-effects estimation, Number of obs = 352, Estimator: nearest-Neighbor matching, Matches: requested =1, Outcome model: matching, min =1, max = 1 and, Distance metric: Mahalanobis						
Total Expenditure	**Coef.**	**AI Robust Std. Err.**	**z**	**P > z**	**[95% Conf. Interval]**	
ATE Participation	7333.494	1224.554	5.99	0.000	4933.411	9733.577
Treatment-effects estimation, Number of obs = 353, Estimator: nearest-neighbour matching, Matches: requested = 1, Outcome model: matching, min =1, max = 5, and Distance metric: Mahalanobis						

4.4. Triangulation with Qualitative Information

The narration of key informant interviews and focus group discussions is used to triangulate the survey findings. The key informant interviewee and focus group discussants revealed that NFEA is practiced in their localities and Woredas. Moreover, the key informants indicated that almost 50% of households participated in NFEA. The result is nearly consistent with the survey, which showed that 54.957% participated in NFEA. Key informant interviewees and focus group discussants also showed various array of NFEA are practiced in the study areas such as trade, street and pity trade, handcraft activity, stonework, grain milling, wood and metal work, beverages and food, charcoal work, beauty salon, daily wage work, tailoring, fruit and vegetable selling and so on. The key informant interviewee and FGD

indicated household participation in NFEA is driven by consumption smoothening, saving, purchasing agriculture inputs, paying credit, and financing student expenditure. Therefore, the findings from key informant interviews and focus group discussions (FGD) are consistent with the results from the survey. Household participation in NFEA is inhibited by a lack of credit access, government support, and infrastructure access and a lack of interest and motivation.

> *"One of the FGD stated when we need credit from finance sectors to start our business, we cannot access it because the interest rate is high or requested collateral. Therefore, we are discriminated against and forgotten from the financial markets. Other FGD indicated that the government officials did not give us continuous support. Further officials come when they need information which seems for report purposes or come at the start of business and then after, there is no continuous support and follow-up. However, we need continuous technical and material support, and training."*

The key informant interviewee revealed participation in NFEA raises household income and improves livelihood and well-being. Moreover, it creates employment opportunities and raises consumption of locally produced goods which in turn encourage local producers. Similarly, the FGD indicated participation in NFEA boosts income, satisfies local demand for local products, creates employment opportunities, and serves as a base to start micro and small enterprises. Moreover, the key informant interviewee and FGD revealed that most households have a positive attitude towards NFEA. Finally, key informant interviewees and FGD were asked about the support they need from the government to upturn NFEA participation. The key informant interviewees responded they need to create market opportunities and chains with input and output traders, availing credit with a reasonable interest rate, life skills and entrepreneurship training, electrification, and transportation. In addition, the FGD revealed they need technical and financial support and entrepreneurship training within the context of local nonfarm activities. Moreover, households required additional land to run NFEA, credit access, and infrastructure.

5. Conclusions and Recommendations

The study investigated the determinants of participation in nonfarm economic activities using the logistic model and examined its impact on household livelihood outcomes using PSM. NFEA is a multifaceted set of activities and participation driven by economic motives. Moreover, the sector is not seasonal and it is practiced almost all over the year. Households engage in the sector to meet their consumption needs, saving, supporting agricultural inputs, education, and paying off debt. Households not involved in NFEA are inhibited by a lack of market, infrastructure, and government support. Adequate income from farming also reduces households' participation in NFEA. Several factors influence household participation in NFEA which can be grouped as demographic, economic, infrastructure, social capital, and government support factors. In contrast to farming, NFEA requires less energy since the likelihood of participation for females is higher than for males. At an early age, the likelihood of participation increases while decreasing as the age of the household increases. The likelihood of participation in NFEA is higher for single households than for married ones. Households with large family sizes are more likely to partake in NFEA than those with smaller family sizes. Attaining primary and secondary education increases the probability of participation. Economic and infrastructure, credit, market, transport, land, and livestock influence participation in NFEA. Access to credit increases household participation in NFEA. In addition, households with access to market and transport are more likely to participate than those without access to it. An increase in the land and livestock decreases participation in NFEA. Social factors such as membership of cooperatives increase participation in NFEA. Government support through training and extension services also raises participation. The average treatment effect estimated by various propensity score matching showed participation in NFEA significantly improves the livelihood of rural households.

Given the heterogeneous nature of rural NFEA and its importance, government and stakeholders targeted on rural development, women empowerment, employment creation, and poverty reduction should prioritize the sector. First, the sector is vital to empowering women, creating employment opportunities and livelihood strategies and reducing poverty.

Therefore, the sector should be integrated into national, regional, and zonal policies as a strategy to promote women's economic empowerment, improve livelihoods and employment and reduce poverty. Second, access to transport and market facilitates transactions and creates opportunities for important raw materials or inputs and the sale of outputs. Therefore, to increase rural household participation in rural NFEA and exploit its advantage, a rural infrastructural development program is vital, which could also have spillover effects on the development of the agriculture sector and reduce rural-urban migration and urbanization of rural areas. Third, access to credit is essential for purchasing important raw materials and inputs. Therefore, the government and stakeholders involved in rural development should support households by providing credit at reasonable interest rates and offering guarantees to those

without collateral. Fourth, providing education and training helps rural households gain the knowledge and skills needed to take advantage of local and available opportunities. Thus, entrepreneurship training and training about the importance of rural NFEA should be given to increase rural innovation and entrepreneurship. In addition, extension workers should be given rural entrepreneurship training which, in turn, provides training for rural households. Fifth, any form of association or cooperative, such as Equib or Edir is instrumental social capital that should be maintained by the government and given legal protection and enforcement.

Acknowledgments

We acknowledge Wolkite University Research and Development Office for funding this research.

Author Contributions

Both E.K.M., N.M.N. are involved in the study's design, conception, and development, and analysis. All the authors also read, reviewed, and approved the final document of the manuscript.

Ethics Statement

No potential conflict of interest was reported by the authors.

Informed Consent Statement

The protocol of this study was approved by the Research Ethics Committee of Wolkite University, College of Business and Economics, on 19 February 2020 (Protocol Code: CBE 05/2020). Respondents had to sign the informed consent before starting the survey, the interview, and the focus group discussion.

Funding

The study is funded by Wolkite University, Research and Development Office.

Declaration of Competing Interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

Footnotes

1. For more detail visit: https://latitude.to/articles-by-country/et/ethiopia/60109/gurage-zone.
2. Household age has three categories, early working age (15–24) years, prime working age (25–54) years, and mature working age (55–64) years.
3. Education is grouped into three groups, no education, basic education (1–8 grade), and secondary education (grade 9–12). Basic education comprises people who attain grades 1–8 and other forms acquired through formal learning. Besides, technical and vocational training are included in secondary education.
4. Equib is a traditional financial arrangement in which every member contributes money in regular time intervals and gets money in rotation according to their contribution. Edir is a traditional society association practiced in Ethiopia in which members make monthly contributions and receive payment in return when unforeseen events occur.
5. Ref. [31] noted the objective of PSM is to match individual participants with statistically constructed similar nonparticipants using observed characteristics then, the average difference in outcome variable between participants and nonparticipants is quantified.

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