academicJournals

Vol. 6(7), pp. 299-308, July, 2014
DOI: 10.5897/JDAE2013.0518
Article Number: 5DDDB7045621
ISSN 2006-9774

http://www.academicjournals.org/JDAE

Journal of Development and Agricultural Economics

Full Length Research Paper

The role of the rural labor market in reducing poverty in Western Ethiopia

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Received 10 September, 2013; Accepted 27 January, 2014

This study examines the role of the rural labor market in reducing poverty and improving the well-being of smallholder farmers in rural Ethiopia. Propensity score matching technique is used to estimate the effect of labor market participation on poverty, consumption expenditure and income of smallholder farmers. The overall result indicates that the rural labor market contributes significantly to income growth, consumption expenditure and poverty reduction among smallholder farmers. Particularly, participation in off-farm wage activity has a positive and significant effect on household consumption expenditure and income but a negative and significant effect on the likelihood of a household being poor.

Key words: Poverty, rural, labor market, household, smallholder, propensity score.

INTRODUCTION

The rural poverty and the living conditions of the rural people in developing countries are highly heterogeneous problems. The problems are much sever and diverse in rural Africa, as a result of which farm households in such countries adopt different livelihood strategies (David, 2010). Although, many different efforts were made by governments of developing countries to fight rural poverty, the heterogeneous nature of the problem along with diversified livelihood strategies adopted by households made the efforts more difficult; and therefore poverty reduction remained to be the major policy challenge facing almost all countries in the developing world. In fact, poverty reduction requires that individuals be engaged in productive employments and economic activities that could help them generate adequate income to secure better living; and that development endeavors need to be targeted to the sectors where most of the poor employed and live (Ellis, 2001; Haggblade et al., 2010; Bernardin, 2012). Obviously, in the context of developing countries, the appropriate area is the rural and agricultural sector. Because three out of every four poor people in developing countries live in rural areas; most of them depend directly or indirectly on agriculture for their livelihoods and daily consumption (World Bank, 2008). Thus, agriculture remains to be the main source of livelihood for the majority of households in developing countries and thus expected to make significant contribution to poverty reduction efforts. However, the potential of the sector to contribute to poverty reduction efforts depend to a large extent on broad-based

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productivity growth. But such growth require improving the asset position of the rural poor, creating an access to technological innovation, making smallholder farming more competitive and sustainable, diversifying income sources towards the labor market and the rural non-farm economy (David, 2010), which could of course not be actually realized in sub-Sahar African countries.

The importance of agriculture to poverty reduction efforts were clearly demonstrated during the economic transformation of Asian countries where rapid growth of productivity in the farm sector helped drive this process (Awuor, 2007). However, this is not the case in most parts of sub-Saharan Africa, where farm households failed to achieve rapid growth in agricultural productivity (Jayne et al., 2010; Kwadwo and Samson, 2012). Therefore, it is evidenced that agriculture on its own is unable to provide sufficient means of survival and the escape out of poverty for the majority of poor households in Africa (Awuor, 2007; Emmanuel, 2011). As a result, households in rural areas participate in multiple economic activities and diversify income sources to minimize the effect of low farm income.

In view of this and as in the case of most African countries, agriculture in Ethiopia is dominated by smallholder farming. In such farming system with low agricultural productivity the engagement of farmers solely in to agriculture may not be adequate to successfully fight poverty because of poor access of smallholder farmers to key agricultural inputs. Thus, rural households look for additional employment opportunities to supplement subsistence farming. One such opportunity available for most smallholder farmers in rural western Ethiopia is participation in off-farm labor market. Even though there are vast literatures showing the contribution of off-farm activities to rural households in developing countries of Asia and Latin America (Verner, 2006; Otusu and Yamano, 2006; Micevska and Rahut, 2008), there is still little empirical evidence on the role of the rural labor market in reducing poverty and improving household welfare in rural Africa, particularly in Ethiopia. Most of the previous studies in Ethiopia had been largely limited to analyzing the determinants of participation in off-farm work, with no evidences on the importance of participation on the welfare of households. Generally, empirical studies that analyzed the role of off-farm labor markets on the farm household income and poverty status are scarce and they are almost absent in case of Ethiopia.

Therefore, the objective of this study is to empirically examine the role of off-farm labor markets in reducing poverty and improving welfare of smallholder farmers in rural Ethiopia. To this end, the effects of labor market participation on rural poverty, household income and consumption expenditure were examined, separately for participation in off-farm wage and self-employment and overall off-farm employment activities. Considering the self-selection nature of participation in the labor market, propensity score matching technique was employed to account for selection bias that may arise when participation is not randomly assigned.

Labor markets and rural poverty: Theoretical and empirical overview

Poverty and labor markets are strongly related in that earnings from participation in the labor market are among the main sources of income for participants. The implication of this is that the likelihood of participation in the labor market and the ability to earn income from such activities could be considered to be important in affecting the earning potential and level of poverty. However, this ability and the amount of income earned from such participation may depend to a large extent on the functioning of labor markets, the nature of off-farm activities that the poor engage in, and labor protections the markets accord (Barbara et al., 2012).

The rural labor market consists of employment opportunities both in the farm and off-farm activities. The farm labor market may be of large-scale mechanized and large family farms that depend heavily on hired farm labor and small-scale sub-sector characterized by smallholder farming where labor is mostly obtained from family sources with limited use of hired workers in varying proportions. The labor market in the later case is usually characterized by hiring farm labor on a casual, day-to-day basis (Bardhan and Udry, 1999; Mazumdar, 1989). But until recently, the academic and institutional literature on the labor market in rural Africa revealed a picture in which rural labor markets are either absent or very thin reflecting the situation that they are relatively neglected areas in research (Bardhan and Udry, 1999; Leavy and White, 2003). As pointed out by Carlos (2010), despite the relative neglect, the labor market in rural Africa is alive and operational; even though it is imperfect and fails to operate efficiently.

Recently, off-farm labor markets have become important components of livelihood strategies among rural households in most developing countries. A number of studies have documented substantial contribution of such markets to household income, consumption expenditure and level of poverty. Some of these empirical studies are discussed subsequently. Sosina et al. (2012) explored whether non-farm employment leads to higher consumption expenditure growth in Ethiopia. Their findings indicated that the household consumption expenditure growth is positively correlated with the initial share of non-farm income and that the growth elasticity of non-farm income share is higher for wealthier households. Similarly, in Ghana, Victor and Awudu (2009) investigated the impact of non-farm employment on farm household income and way out of poverty using propensity score matching method. Their finding indicated that non-farm employment had a positive and

robust effect on farm household income and consumption expenditure but a negative and significant effect on the likelihood of being poor.

In rural Argentina, Verner (2006) conducted empirical study on the rural labor market and its income generation ability. His findings revealed that the vast majority of the rural employees were engaged in the off-farm activity. Similarly in Asia, Otusu and Yamano (2006) examined the role of the rural labor market in long-term process of poverty reduction in comparison with the current situation in East Africa. Their findings indicated that the reliance on agricultural labor market alone would not reduce poverty to a significant extent in view of the declining share of agricultural wage income in Asia and its negligibly low level in East Africa.

Finally, in Ethiopian, Mulat et al. (2006) has documented that employment and labor market variables had a significant impact on poverty. Since employment was identified as one of the critical avenues for poverty reduction, it is important to examine the structure of the labor market to identify the areas where the poor or vulnerable groups are concentrated for intervention in reducing poverty.

MATERIALS AND METHODS

The data set and situation of off-farm labor market in the study area

Description of data set

The data set used in this study was obtained from survey of 324 sample households in rural western Ethiopia. The sample households were selected from three districts of western Ethiopia (namely Guto Gida, Gida Ayana and Jima Arjo). They were selected purposively based on their diversity in terms of access to off-farm work, experience and exposure to labor market participation and variations in the nature and extent of participation. Moreover, they represent broad climatic condition reflecting high land and low land area, variations in markets and socio-economic infrastructure. Sample households were selected randomly and proportionately. They were interviewed using structured questionnaires that require short recall period. The data collection process took almost one year (June, 2010 to April, 2011) and is conducted in three rounds following main agricultural seasons in the study area. The first round representing ploughing and weeding seasons (May, 2010 to October, 2010), the second representing harvesting and threshing seasons (November, 2010 to February, 2011) and the final round for off-agricultural season (February, 2011 to April, 2011). Round surveys were used in order to capture variations in household time allocation and prices that change following agricultural seasons. But the data representing a variable in each of the three surveys were summed to arrive at annual figures.

The off-farm labor markets in the study area[1]

Farm households in the study area participated in different types of off-farm activities that include both wage employment and self-employment. About 73.5% of sample households reported that they participated in off-farm activities (both in wage employment and self-employment) out of which 77% were participants in wage employment and the remaining in off-farm self-employment. As the data indicates, out of the total sample size, about 52.2% reported that they participated in off-farm wage employment and 21.3% in off-farm self-employment activity. The fact that farmers participated more in wage employment during busy agricultural season but in off-farm self-employment activity during slack agricultural season reflects the importance of agricultural as main source of wage employment in the study area.

The most important types of wage employment activities in terms of participation were causal agricultural employment (39.4%) followed by employment in government sector (20.2%), unskilled wage worker (16%) and private sector employment(14.7 percent). Similarly, there are different types of non-farm self-employment activities in the study area. Among the major ones are production and sale of local food and drink (28.9%), trade in food grain, manufactured goods, livestock and livestock products (24.6%), collecting and selling firewood, water, grass, straw and charcoal (14.4%), handicraft, including weaving, making and selling equipment and pottery (13.4%) and others.

The two major reasons for participating in off-farm activities as identified by respondents were limited farm income to support livelihood and inadequate land to cultivate. Most sample farm households (about 76%) reported that they were engaged in off-farm activities because farm work is not able to generate adequate income for their livelihoods. About 65% of the participants reported that they participated in such activities because they do not have adequate land to cultivate.

Another important aspect of the rural labor market in the study area is participation in different labor market regimes. Out of 324 total sample households, 35% participated as sellers only, 21% as buyers only, 17% as simultaneous buyers and sellers and the remaining 27% are self-sufficient households.

Estimation strategy

As stated previously, the main purpose of this study was to analyze the role of the rural labor market in reducing poverty and improving wellbeing of households in the study area. Even though simple regression analysis may serve the purpose, it is not an appropriate approach to capture the effect of market participation as it may generate biased estimates. This is because as indicated by Caliendo and Kopeinig (2008) such regression assumes exogenous determination of participation while it may be potentially endogenous. The difficulty arises since researchers want to know the difference between the outcomes of treated and non-treated groups at the same time, which of course could not be observed at the same time due to the problem of self-selection bias. Thus, linear regression will not be appropriate and thus the use of the non-parametric approach called Propensity Score Matching (PSM) was preferred.

Even though the PSM technique was initially used to evaluate the impact of a project/program by considering the implementation of the programs as treatment, recently the approach has been extended to problems that self-select due to individual decisions. There are a number of similar empirical studies that dealt with the problems of self-selection due to individual decisions using PSM technique. For instance, Mariapia (2007) analyzed the impact of agricultural technology adoption (considering participation to adopt as a treatment variable) on poverty alleviation strategies in rural Bangladesh. In the same way, Fydess et al. (2011) measured the effect of participation in charcoal production on household income and poverty in three districts of western Uganda using household survey data and PSM techniques. They took participation in

[1] The study area is located in western part of Ethiopia, 330 km from Addis Ababa.

charcoal production as a treatment and tried to find the average effect of participation on household income, poverty. Similarly, Menale et al. (2010) analyzed the impact of adopting improved varieties on crop income and rural poverty in rural Uganda using cross-sectional farm household data and PSM method. Tanguy et al. (2007) had also assessed the impact of marketing cooperatives on the behaviour and welfare of their members based on detail household data in rural Ethiopia employing PSM techniques. Finally, Victor and Awudu (2009) investigated the impact of non-farm employment on farm household income and way out of poverty using farm household data from Brong-Ahafo region of Ghana and employing the PSM technique. All these empirical studies justify the use of PSM technique under situations that require self-selection due to individual decision as in the case of rural off-farm labor market participation on poverty.

In the context of this study, propensity score matching constructs a statistical comparison group by matching every individual observation of labor market participants with an observation of similar characteristics from the group of non-participants. It is a two-step procedure. First, a probability model for participation decision is estimated to obtain propensity scores of participation for each observation. In the second step, each participant is matched to a non-participant with similar propensity score values to estimate the average treatment effects. As defined by Rosenbaum and Rubin (1983), the propensity score P(X) is the conditional probability of receiving a treatment given pre-treatment characteristics. It is given as;

$$P(X) = P_r(T_i = 1/X) = E(T/X) \quad (1)$$

Where T_i = (0, 1) is the indicator of an exposure to off-farm labor market given the covariates (X's) which represent the vector of pre-treatment characteristics.

In order to estimate ATT, the potential outcome framework was adopted (Wooldridge, 2002) where each household is viewed as facing two potential outcomes: One arising from participation in labor market and the other from non-participation. Therefore,

$$\begin{aligned} ATT &= E(Y_i^1 - Y_1^0 \setminus T_i = 1) \\ &= E[E(Y_1^1 \setminus T_l = 1, P(X_i) - E(Y_i^0 \setminus T_l = 0, P(X_i) \setminus T_i = 1] \end{aligned} \quad (2)$$

Where $P(X_i)$ is the propensity score, Y_i^1 is the potential outcome in the situation of participation and Y_1^0 is the potential outcome in the situation of non-participation.

As outlined by Caliendo and Kopeinig (2008), important properties (conditions) for the implementation of propensity score matching technique are the balancing property, conditional independence assumption (CIA) and common support condition. The balancing property indicates the condition that each participant is required to be matched with a non-participant of similar propensity score values. Testing for balancing property is important to make sure that household behaviour within each group is actually similar. The second is the Conditional Independence Assumption. This states that, once the set of all observable characteristics are controlled for, participation in off-farm work is random and uncorrelated with outcome indicators. That means systematic differences in outcome indicators between participant and non-participant individuals with the same values for covariates are attributable to treatment. The third requirement is the common support condition which requires that sample households with the same values of covariates *X* have positive probabilities of being both participants and non-participants. Therefore, all the individuals in the common support region actually participate in all states.

The actual implementation of the propensity score matching technique in this study was carried out through the following simple model. Second, the matching algorithm was chosen. In this case both Nearest Neighbour (NN) matching with calliper and Kernel-based matching were used just for the purpose of comparison (Imbens, 2004; Abadie and Imbens, 2006). Third, the issues of overlaing and common support region was check for to ensure that any combination of characteristics observed in the labor market participants can also be observed among non-participants (Bryson et al., 2002). Fourth, the matching quality was tested to ensure that the distribution of the relevant variables in both groups is balanced. The standardized bias, mean difference of covariates, Pseudo-R^2 was used for this purpose (Rosenbaum and Rubin, 1983; Sianesi, 2004). Existence of differences after matching may suggest a fundamental lack of comparability between the two groups (Blundell et al., 2005) which indicate that the technique was not successful requiring some remedial measures.

Finally, the technique is applicable for estimating average treatment effects provided that the assumption of conditional independence is satisfied. For this purpose it is important to check the sensitivity of the estimated results as it helps to know whether unobservable factors have an effect strong enough to undermine the implications of the matching analysis. If there are unobserved variables that affect participation and the outcome variable simultaneously, a hidden bias might arise to which matching estimators are not robust. The sensitivity analysis test is conducted using bounding approach proposed by Rosenbaum (2002) and applied by Caliendo and Kopeinig (2008). The probability of participation, π_i, is not only determined by observable factors (x_i) but also by an unobservable component (u_i): $\pi_i = \Pr(D_i = 1 \setminus x_i) = F(\beta x_i + \alpha u_i)$, where the parameter α is the effect of u_i on the participation decision. From this, if the analysis is free from hidden bias, α will be zero and the participation probability will solely be determined by x_i. However, if there is hidden bias, two individuals with the same observed covariates x will have differing chances of participation in the labor market. For matched pair of individuals i and *j,* following logistic distribution, the odds that individuals receive a treatment (participation) are then given by $P_i/(1- P_i)$ and $P_j/(1- P_j)$, and the odds ratio is given by;

$$\frac{P_i/(1-P_i)}{P_j/(1-P_j)} = \frac{P_i(1-P_j)}{P_j(1-P_i)} = \frac{\exp(\beta x_i + \gamma \mu_i)}{\exp(\beta x_j + \gamma \mu_j)} \quad (3)$$

If both participants and non-participants have identical observed covariates as implied by the matching procedure, the *x* vector cancels out, implying that:

$$\frac{\exp(\beta x_i + \gamma \mu_i)}{\exp(\beta x_j + \gamma \mu_j)} = \exp\{\gamma(\mu_i - \mu_j\} \quad (4)$$

But, still both individuals may differ in their odds of receiving treatment by a factor that involves the parameter γ and the difference in their unobserved covariates *u*. Sensitivity analysis evaluates how changes in the values of γ and ($u_i - u_j$) alter inferences about the estimated effect. According to Rosenbaum (2002), Equation (4) above implies the following bounds on the odds ratio that either of the two matched individuals will receive treatment:

$$\frac{1}{e^{\gamma}} \leq \frac{P_i(1-P_j)}{P_j(1-P_i)} \leq e^{\gamma} \quad (5)$$

So, both matched individuals have the same probability of participating only if $e^{\gamma} = 1$. Otherwise, if for example $e^{\gamma} = 2$, individuals who appear to be similar in terms of covariate *x* but could differ in their odds of receiving the treatment by as much as a

Table 1. Characteristics of labor market participants and non-participants.

Name of the variables	Participants	Non-participants	Mean dif.
Age of the head	40.52 (11.2)	38.38(10.4)	2.15**
Education level of the head	4.32(3.7)	5.22(3.7)	0.89***
Sex of the head (1= male)	0.98(.00)	0.98(.0)	0.00
Family size	6.01 (0.2)	5.89(0.2)	0.02
Number of dependents	2.35(1.8)	3.05(1.8)	0.36**
Number of adult laborers(aged 15-64)	4.12(1.8)	3.76(1.6)	0.25**
Animal wealth in TLU	5.38(0.3)	5.49(0.3)	0.10
Value of variable farm input	714.95(1003)	1,132.6(1494)	408***
Value of farm implement	384.7(185)	434(181)	49***
Land owned in hectares	2.22(1.38)	3.11(1.70)	0.89***
Land owned in adult equivalent	0.51(0.34)	0.72(0.44)	0.21***
Land cultivated in hectares	2.07(0.10)	2.89(1.44)	0.83***
Value of off-farm equipment owned	364.13(1022)	151.85(748)	212**
Number of draft animals owned	0.20(0.62)	0.39(0.77)	0.18***
Amount of non-labor income in Birr	144.03 (632)	287.3(774)	143*
Amount of credit in Birr	309.59(777)	333.19(834)	23.60
Dummy for Jima Arjo	0.33(0.47)	0.29(0.46)	0.04
Dummy for Guto Gida	0.38(0.49)	0.33(0.47)	0.05
Annual household income	9,095.52(9179.9)	8,408.73(9717)	686.79**
Total annual consumption expenditure	8,140.07(2652)	7,684.42(2638)	455.65***
Household income per adult equivalent	5,780.97(1128)	5,393.24 (1164)	387.73*
Consumption per adult equivalent	5,126.27(673)	4,839.58(712)	286.69***
Poverty status (head count ratio)	0.341	0.389	- 0.048**

Source: Own computation, 2012; ***, **, and * significant at 1, 5, and 10% level of significance. Incidence of poverty for the whole sample is 35.8%. Standard deviations in parentheses. All values are in Birr (Ethiopian currency unit).

factor of 2. In this sense, e^{γ} is a measure of the degree of departure steps. First, the propensity scores were estimated using the logit from a study that is free of hidden bias (Rosenbaum, 2002).

RESULTS AND DISCUSSION

Descriptive analysis of labor market participants and non-participants

The participation in off-farm labor market is measured as a dummy variable taking value 1 if the household participated during the survey year and 0 otherwise. The result of mean comparison test for off-farm wage participants and non-participants is provided in Table 1. The result reveals existence of a number of differences in household endowments, farm characteristics, family composition and socio-economic variables across participants and non-participants. For instance, on average, non-participant households have significantly younger heads (38 compared with 40 years) and are better educated than participants. Key differences were also observed between both groups in terms of family composition. On average, participant households have smaller number of dependents and larger number of adult laborers as expected. Participant and non-participant households also differ significantly in terms of the value of farm assets and variable farm inputs owned. For instance, on average, labor market participant farmers cultivated smaller farm size, owned significantly lower value of farm equipment and farm variable inputs. Moreover, significant differences were observed between the two groups in non-labor income, ownership in off-farm assets such as draft animals and value of off-farm equipment. However, there were no significant differences between participants and non-participants in terms of variables such as sex of the head, family size, animal wealth, the amount of credit, location and distance to the nearest market center.

Finally, differences between labor market participant and non-participant households in terms of the outcome indicators are reported in the same table. The outcome indicators used in the analysis were level of poverty (head count ratio), annual household consumption expenditure and income both in adult equivalent units. In order to classify households as poor and non-poor, the recent consumption-based poverty line which is officially declared by the government of Ethiopia (based on the 2010/2011 Welfare Monitoring Survey) was used.

Accordingly, the total poverty line per adult person per

year was estimated to be Birr 3,781(MoFED, 2012).
The total poverty line of Birr 3,781 and the information on consumption expenditure obtained from sample households in the study area were used to classify households as poor and non-poor. The poverty status of a household is measured as a binary variable indicating 1 if the household is non-poor and 0 otherwise. Based on the data, the incidence of poverty for the whole sample is 35.8%. That is, among 324 sample households included in this study, 115 (about 35.8%) were found to be poor during the survey year. Moreover, as shown in the table, about 38.9% of non-participants and 34.1% of the participant households fell below the poverty line.

The poverty figures are higher than the national average may be because of the method of data collection which was very intensive in this case. The annual household consumption expenditure includes total expenditure on all purchased as well as own produced consumption goods (evaluated at the current local prices in the study areas). Participants are significantly distinguishable from non-participants in terms of annual consumption expenditure and income per adult equivalent. The annual average total and per adult equivalent consumption expenditures during the survey year were Birr 8,140.1 and 5,126.3 respectively for labor market participant households. The similar figures for non-participants were Birr 7,684.42 and 4,839.6 respectively. Likewise, average annual household income is higher for participants than non-participants (Birr 9,095.5 as compared to Birr 8,408.7).

Average effects of off-farm labor market participation on welfare indicators

The result of logit model estimated for predicting the propensity score is provide in Annex Table A. The result shows fairly low pseudo R^2(0.29, 0.20 and 0.37 for off-farm wage work, self-employment and the total off-farm work, respectively). This may indicate that it would be easier to find good match between participant and non-participant households. In general, the estimated result indicates that the probability of participation in wage work is positively and significantly influenced by age and sex of the household head, the number of adult laborers in the family and distance to the nearest market center. The number of dependents and the size of land cultivated significantly reduced the probability of participation in wage work. Moreover, availability of financial resources such as credit obtained had no significant effect on off-farm wage employment, but it significantly increased the probability of participation in off-farm self-employment activity. In all cases, the amount of non-labor income and the animal wealth variables measured in a tropical livestock unit were not significant in influencing the likelihood of participation in any type of off-farm activity. Finally, location differences also affect the probability of participation in off-farm wage employment but not off-farm self-employment.

Before predicting the average effects of participation on outcome indicators, it is essential to test the balancing property and the matching quality of the propensity score. Accordingly, the t-test on covariates, the significance of pseudo R^2 and Likelihood Ratio tests were conducted before and after matching. The test results for participation in wage employment are reported in Annex Tables B and C. It shows that for almost all covariates, the t-ratios are insignificant after matching indicating that there are no systematic differences between the two groups after matching. Similarly, after matching the pseudo-R^2 value is very low as compared to before (0.042 against 0.29 for off-farm wage work) and also the p-value for LR χ^2 is insignificant after matching. The results in general indicate that there are no systematic differences between the two groups after matching. This implies that PSM has created a high degree of covariate balance in this study.

Finally, the goal of propensity score matching in this study is to obtain the average effect of off-farm labor market participation on consumption expenditure, income and poverty. To this end, two alternative matching algorithms, namely the Nearest Neighbor Matching (NNM) and the Kernel Based Matching (KBM) were used based on implementation of common support region with caliper so that the distributions of observations for both groups are located in common support region. As suggested by Rosenbaum and Rubin (1983), a caliper size of one-quarter of the standard deviation of the propensity score was used. The result is presented in Table 2.

In general, the result indicated that labor market participants are better off than non-participants in terms consumption expenditure, household income and poverty. As shown in the table, the NNM result reveals that participating in off-farm wage activity has significantly increased household income per adult equivalent by 39% and consumption expenditure by about 26%. That means, the income and consumption expenditure per adult equivalent family size for households participated in off-farm wage employment is greater than that of non-participants by 39 and 26% respectively. The KBM also provides comparable and significant results. Furthermore, it can be seen from the table that participation in off-farm wage employment has significantly reduced the level of poverty. Accordingly, the coefficient of poverty for NNM (-0.096) indicates that the probability of participant household falling below the poverty line is 9.6 percent less than that of non-participants. The KBM approach also provides significant reduction in poverty.

Similarly, the annual household income per adult equivalent for participants of off-farm self-employment activity is significantly higher than non-participants by about 49% in NNM approach and by 35% in KBM respectively. However, the impact on consumption

Table 2. Average effects of participation in off-farm work on household welfare indicators (PSM-estimation result).

Type of participation	Welfare indicators	NNM matching		KBM matching	
		ATT(S.Dv.)	t-stat	ATT(S.Dv.)	t-stat
Off-farm wage employment	Ln (Income)	0.394(0.13)	3.001***	0.312(0.06)	4.567***
	Ln (Expenditure)	0.262(0.08)	3.150***	0.239(0.04)	5.728***
	Poverty (1/0)	-0.096(0.03)	-1.874*	-0.073(0.03)	-1.763*
\Off-farm self-employment	Ln (Income)	0.493(0.20)	2.457***	0.346(0.11)	3.222***
	Ln (Expenditure)	0.067(0.08)	0.828	0.018(0.05)	0.155
	Poverty (1/0)	-0.022(0.01)	-0.167	-0.008(0.02)	-0.267
Overall off-farm employment (both self and wage)	Ln (Income)	0.581(0.13)	4.482***	0.506(0.08)	6.446***
	Ln (Expenditure)	0.304(0.11)	2.759***	0.292(0.04)	7.055***
	Poverty (1/0)	-0.292(0.08)	-2.102**	-0.172(0.11)	-1.96**

Source: Own computation, 2012. ***, **, and * significant at 1, 5, and 10% level of significance.

expenditure and poverty is very small and insignificant. Moreover, participants of off-farm self-employment are less likely to be poor by about 2.2% using the NNM method which is also not significant indicating that compared to wage employment activity, the importance of self-employment activity is limited in the study area.

The average effect of overall off-farm employment (both wage and self-employment) is also reported in the same table. The result indicates that the income per adult equivalent of off-farm labor market participants is higher than those of non-participants by about 58% in NNM and by about 51% in case of KBM. Similarly, the annual household consumption expenditure per adult equivalent for off-farm participants is 30% higher than that of non-participants (and 29% in case of KBM). Finally, the average effect of participation in off-farm work on poverty reduction is also larger and significant as shown in the table. The coefficient of poverty in NNM (-0.292) indicates that off-farm participants are less likely to be poor by about 29% on average as compared to non-participants.

The average effects of participation in off-farm labor market on outcome indicators identified in this study are generally low as compared to an empirical finding by Victor and Awudu (2009) in Brong-Ahafo region of Ghana which were 62 and 35%, respectively for the impact of participation in wage employment and self-employment on poverty respectively.

Finally, the test result of sensitivity analysis for participation in off-farm wage work reported in annex Table D indicates that the critical values of gamma (e^{γ}), the values at which we would question our conclusion of the effect of labor market participation on consumption expenditure, income and poverty starts from values equal to 1.8, 1.9 and 1.5 respectively. Since these values are large, the effects of participation are not generally sensitive to problem of unobserved variables. For instance, the value of gamma = 1.7 for consumption expenditure shows that the impact of participation on household consumption expenditure is not sensitive to selection bias due to unobserved variables even if participants and non- participants were allowed to differ by as much as 70% in terms of unobserved covariates. Generally, the test results lead us to conclude that the estimated average effects are totally insensitive to hidden bias, and thus are generally pure effects of labor market participation.

SUMMARY AND CONCLUSION

In this study efforts were made to examine the role of the rural labor market in reducing poverty and improving welfare of households by using propensity score matching technique. The effects of participation in off-farm employment on household poverty, consumption expenditure and income were examined. The finding, in general, confirmed that off-farm participant households are better off than non-participants in terms consumption expenditure, overall household income and level of poverty. The income and consumption expenditure of households who participated in off-farm wage employment were significantly greater than that of non-participants. Moreover, on average, participant households are less likely to be poorer by about 29%, as compared to non-participants. Finally, off-farm self-employment activity (mostly non-agricultural activity) is limited in the study area and not significant at influencing consumption expenditure and reducing poverty.

The findings are in harmony with the mounting attention of governments in promoting off-farm activities in rural areas of developing countries as an alternative means to get out of poverty. Therefore, the implication is that policy measures which are directed towards promoting off-farm work opportunities in the study area are relevant to achieve the goals of poverty reduction. Moreover, it is essential to provide incentives and increase the capacity of households to participate in rural non-farm activities to

take advantage of such opportunities. Such intervention would help overcome some entry barriers to off-farm employment thereby promoting efficient functioning of the rural labor market in the study area. In addition to being one important source of income for rural farm households, off-farm employment could help smooth incomes, which in turn smoothens consumption over long periods of time.

Conflict of Interests

The author(s) have not declared any conflict of interests.

ACKNOWLEDGEMENTS

The author express their thanks to Haramaya University and Wollega University (both in Ethiopia) for the financial support they provided us to successfully complete the research; East Wollega Zone Office of Agriculture and Rural Development for facilitating the contact with the districts in the study area and with the development agents, and the development agents who helped in conducting the survey.

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ANNEX

Table A. Logit estimation result (for predicting the propensity scores) [Dependent variable: Participation in off-farm work (1/0)].

Explanatory variable	Participation					
	Wage work		Self-employment		Overall off-farm work	
	Coef.	St.Er	Coef.	St.Er	Coef.	St.Er
Age in years	0.024***	0.011	-0.140	0.112	-0.102	0.095
Age square	-0.001***	0.0005	0.002	0.001	0.001	0.001
Education level of the head	0.045	0.055	-0.051	0.064	0.032	0.064
Gender(1=male;0 = female)	0.618***	0.243	0.357**	0.172	0.337***	0.149
Adult laborers(aged 15-64)	0.387**	0.201	0.056	0.036	0.213*	0.130
Elder children(aged 10-14)	0.127	0.259	0.145**	0.075	0.086*	0.044
Dependents	-0.262**	0.126	-0.075	0.153	-0.366**	0.153
Land cultivated in hectares	-1.524***	0.471	-0.101	0.476	-1.007***	0.315
Amount of credit obtained	-0.076	0.052	0.041***	0.008	0.023***	0.007
Animal wealth in TLU	0.250	0.214	-0.065	0.048	-0.012	0.009
Non-labor income	-0.054	0.062	-0.001	0.0007	0.004	0.005
Distance in kms	0.061*	0.035	-0.010	0.041	0.047	0.042
Dummy for Guto Gida	0.343*	0.177	0.083	0.069	0.237**	0.111
Dummy for Jima Arjo	0.169*	0.092	0.120	0.099	0.167*	0.102
Constant	-2.160	2.629	-1.408	0.926	2.285	1.344
Pseudo R^2	0.29		0.20		0.37	
LR chi^2	128.6		37.01		193.44	
Log likelihood	-160.1		-122.4		-114.0	
Prob> chi^2	0.000		0.052		0.000	

Source: Own calculations, 2012. ***, **, and * significant at 1, 5, and 10% level of significance.

Table B. Covariate balancing before and after matching (for participation in wage work).

Variable name	Sample	Mean			Reduction	t-test	
		Treated	Control	% Bias	%|Bias|	t	p>|t|
Age	Unmatched	40.524	38.641	17.8		1.60	0.089
	Matched	39.582	38.563	7.6	57.3	0.75	0.451
Year of schooling of head	Unmatched	4.321	5.218	-24.4		-2.20	0.029
	Matched	4.546	5.214	-18.2	25.5	-1.33	0.183
Average family schooling	Unmatched	0.708	0.732	-9.2		-0.82	0.411
	Matched	0.711	0.731	-7.6	16.8	-0.58	0.565
Gender (1= male)	Unmatched	0.976	0.981	-3.1		-0.28	0.778
	Matched	0.964	0.980	-11.3	-260.1	-0.84	0.400
Number of adult labourers	Unmatched	4.214	3.968	14.5		1.90	0.083
	Matched	4.146	3.945	11.8	18.7	0.90	0.369
Number of young children aged1015	Unmatched	1.191	1.218	-2.6		-0.23	0.817
	Matched	1.273	1.198	7.0	-173.2	0.50	0.620
Number of dependents	Unmatched	2.869	3.237	-20.6		-1.85	0.065
	Matched	3.327	3.208	6.7	67.7	0.49	0.628
Land cultivated in adult equivalent	Unmatched	0.465	0.660	-51.4		-4.65	0.000
	Matched	0.463	0.578	-66.6	-29.6	-1.63	0.094

Table B Contd.

Non-labour income	Unmatched	287.32	144.04	20.3		1.82	0.070
	Matched	258.36	141.06	16.6	18.1	1.35	0.176
Animal wealth in TLU	Unmatched	5.384	5.487	-2.6		-0.24	0.812
	Matched	4.803	5.477	-17.4	-556.1	-1.23	0.218
Credit	Unmatched	309.6	333.20	-2.9		-0.26	0.792
	Matched	132.6	348.12	-26.7	-813.2	-1.86	0.103
Distance to the nearest market in kms.	Unmatched	5.049	4.525	12.3		1.11	0.270
	Matched	4.318	4.466	-3.5	71.8	-0.26	0.794

Source: Own calculation using survey data, 2012.

Table C. Additional indicators of matching quality.

Type of off-farm participation	Pseudo R^2 before matching	Pseudo R^2 after matching	LR χ^2(*p-value*) before matching	LR χ^2(*p-value*) after matching	Total % mean standardize bias reduction
Total off-farm work	0.371	0.057	193.44(0.000)	9.57 (0.793)	87.72
Wage work	0.287	0.042	128.57(0.000)	24.15 (0.256)	84.84
Self-employment	0.197	0.036	37.01(0.052)	13.56(0.631)	84.33

Source: Own calculation using survey data, 2012.

Table D. Sensitivity analysis test for hidden bias (for participation in wage work).

Gamma (e^{γ})	Income	Consumption expenditure	Poverty
	p-value	p-value	p-value
1.0	0.004	0.0001	0.007
1.1	0.008	0.004	0.016
1.2	0.015	0.012	0.041
1.3	0.027	0.022	0.069
1.4	0.036	0.037	0.099
1.5	0.049	0.057	0.134
1.6	0.064	0.078	0.174
1.7	0.081	0.096	0.219
1.8	0.092	0.125	0.268
1.9	0.113	0.154	0.339
2.0	0.168	0.196	0.372
2.1	0.212	0.247	0.429

Source: Own calculation using survey data, 2012.