Does productive safety net programme contribute to reduce households' poverty? Evidence from Rural Tigrai, Ethiopia

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Abstract

This paper evaluated the impact of productive safety net programme on households' poverty reduction in Tigrai, Ethiopia, using primary data collected from 650 households in 2019. A propensity score matching, Foster-Greer-Thorbecke, and Oaxaca-Blinder decomposition techniques were employed to analyse data. Using the total poverty line, the poverty rate was lower for programme beneficiaries (27 percent) than non-beneficiaries (30 percent). The poverty rate for female-headed households was higher (32 percent) than male-headed households (25 percent). Households administered under Relief Society of Tigrai (REST) experienced lowered poverty rate (26 percent) than households administered under government (31 percent). Total consumption per adult equivalent for REST administered households was three times higher than government-administered households. Furthermore, a decomposition analysis revealed that livestock holding, father's education, off-farm income, access to irrigation, farm size, and type of rural productive safety net programme (REST) explained gender gaps by 34, 29, 28, 24, 18, and 13 percent, respectively while dependency ratio, mother's education widened gender poverty gaps by 26 and 22 percent, respectively. Thus, productive safety net programme played a significant role in reducing households' poverty and able to reach the poorest households. Hence, to reduce the overall poverty level of the region as well as the country, due attention has to be given to reducing gender disparity in poverty and sustained effort is needed to government-administered productive safety net programme districts (woredas) to accelerate the rate of poverty reduction.

Keywords: Beneficiary, decomposition, programme, poverty, Tigrai

1. INTRODUCTION

Ethiopia is prone to frequent periods of drought, along with outbreaks of crop and livestock disease. More than 38 percent of the rural Ethiopian households fall below the food poverty line while 15 percent of the rural households reported that they had problems of satisfying their food need with a food gap of greater than four months (Gillingan et al., 2009). In Ethiopia, the problem of food insecurity and poverty has been addressed largely by annual emergency food aid from abroad making the country to be the largest recipient of food aid in Africa as well as in the world (Little, 2008). Thus, realising the magnitude and severity of the poverty and food insecurity, the Ethiopian government launched a Rural Productive Safety Net Programme (RPSNP) as one component of the food security programme in 2005 to support chronically food-insecure rural households. The programme is an important policy initiative that intends to shift millions of chronically food-insecure rural people from recurrent emergency food aid to a more secure and predictable, and largely cash-based, form of social protection. The primary aim of RPSNP is to smooth consumption of the chronic food insecure rural households through provision of food, cash, and/or a mix; prevent households' asset from depletion, and develop community infrastructure assets through a public work programme. The productive safety net programme targets two types of beneficiaries (rural poor households), namely public works beneficiaries (such building health centres and schools, rehabilitating land and water resources, and rural road construction or maintenance), who receive benefits in exchange for the provision of labour, and direct support beneficiaries, who receive transfers on an unconditional basis. The programme is the largest social protection scheme in Africa outside of South Africa's social grants schemes (Devereux and Guenther, 2009, Gillingal et al., 2009). The government of Ethiopia has noted that the programme had many significant achievements, inter alia: More than seven million people have received PSNP transfers enabling them to meet consumption needs, reducing the risks they faced, and providing them with alternative options to selling productive assets (Guush et al., 2013).

Tigrai, where this study was conducted, is one of the most drought-prone and food-insecure regions of Ethiopia affected by recurrent drought and food security problems in the country. Most of the rural people in the region live in conditions of chronic hunger (Van der Veen & Gebrehiwot, 2011). As per the national productive safety net programme, the regional government implemented the productive safety net programme with the purpose to help bridge the income gap of chronically food insecure households since 2005 in 31 woredas (TFSCO, 2008). Eastern zone of Tigrai was selected purposively as a case study mainly because it was among the zones that productive safety net programme was administered both by REST and government parts. The REST has been an implementing partner in the national PSNP since 2006 working in three zones, namely Central, Eastern, and Southern of Tigrai for the chronically food insecure woredas.

Despite the productive safety net programme made significant achievements in reducing the food gaps for the chronically food-insecure households, considerable food insecurity, poverty, and gender poverty disparity remains across regions and place of residence of Ethiopia has been limited. (Sharp et al, 2006, Devereux et al, 2006; Gilligan et al., 2009). Studies indicated that the social safety net programme improved programme beneficiaries' consumption expenditure. For example, in Indonesia, a study by Sumarto et al. (2005) indicated that the impact of social safety

net Programmes on households' consumption expenditure had a positive and significant effect. In Bangladesh, participation in the õFamilias en Accion programö increased households' food consumption by 15 percent compared to the previous year (Ayala and Endara, 2005). Similarly, in Mexico, õProgresaö beneficiary households increased their food expenditure by 33.33 percent more than non-programme beneficiary households (Sedlacek et al., 2000). Furthermore, in South Africa, the poverty gaps among the social safety net beneficiaries reduced by 47 percent (Samson et al., 2007). In Ethiopia, a study by Gillingan et al. (2008) indicated that the productive safety net programme beneficiaries did not experience faster asset growth. Andersson et al. (2009) also indicated that there was no increment in livestock holdings for programme beneficiaries. Furthermore, Nigussa and Mberengwa (2009) indicated that the programme did not have a positive impact on households' assets and consumption spending. Moreover, the findings' of this study indicated that programme beneficiaries remained poor, and indicated that the magnitude of poverty of the respondents and the community as a whole remained high. A study by Guush et al. (2013) also indicated that there was no significant change in food consumption and poverty perception among programme beneficiary households.

Thus, impact question about the productive safety net programme on households' poverty alleviation both at regional as well as at the national level, Ethiopia remains a major research area. Moreover, much less is also known about the determinants of gender disparity in poverty. Therefore, this study addressed this important research gaps and evaluated the impact of productive safety net programme on households 'poverty reduction in rural settings of Ethiopia.

2. OBJECTIVES OF THE STUDY

The overall objective of this study is to assess the contribution of productive safety net programme in reducing poverty in rural settings of Tigrai, Ethiopia. More specifically the study is aimed:

- To evaluate the impact of productive safety net programme on poverty reduction
- To examine the differential impact of productive safety net programme on gender disparity in poverty

3. REVIEW OF LITERATURE

There were previous studies both at international and national levels about social safety net programmes using different approaches and techniques. For example, social safety net programmes in Indonesia were intended to help protect the traditionally poor as well as those newly poor due to crisis. The impact of the programmes on households' consumption spending was found to be positive and statistically significant. This implies that the participation of households in the programme improved their consumption spending. Findings' of this study indicated that participation of households in the programme increased their per capita consumption level by a 4 to 10 percent compared to that of non-participate households (Sumarto et al., 2005). Another study by Safriansyah (2008) also evaluated the performance of social safety net programmes and indicated that the programmes played an important role in helping many of Indonesian households facing the hardship of the economic downturn during the 1997 crisis. This study's results indicated that the programme helped programme beneficiary households to reduce their poverty rates, which declined slightly from 17.4 to 15.5 percent over

the three years (1997 to 2000). Furthermore, households who participate in the programme increased their per capita consumption spending (Safriansyah, 2008).

Attanasion and Mesnard (2006) evaluated Colombia's õFamilias en Accionö, a conditional cash transfer program. The programme was first designed and implemented to mitigate the effect of the economic downturn in the late 1990s on the consumption and wellbeing of poor households, to preserve the accumulation of human capital formation in poor families by providing cash transfers. Some of the principal results were an increase in household consumption of nine percent with a nearly equivalent increase in food consumption, improvement in the nutritional status of young children and an increase in school attendance. Furthermore, the total consumption of programme participants in Colombia has been increased very considerably by19.5 percent in rural areas (Attanasio and Mesnard, 2006).

In Ethiopia, some studies have assessed the impact of productive safety net programme on different outcome variables of interest (Barnes, 2008; Andersson et al., 2009; Gillingan et al., 2009; Nigussa and Mberengwa, 2009; Gebresilassie, 2014; Tesfaye, (2015; Abduselam, 2017; Welteji et al., 2017). Accordingly, Abduselam (2017) examined the impact of Ethiopia's productive safety net programme on the household livelihood in Babile District, Somali regional state, Ethiopia using primary data in 2017. Findings' of propensity score matching revealed that the programme had a positive significant effect on households' total consumption spending. Similarly, Welteji et al. (2017) indicated that results indicated that PSNP enabled programme beneficiary household to smooth their consumption spending, accumulate their asset holdings, and development of their local community.

Gebresilassie (2014) analysed the impact of productive safety net programme on rural household's consumption spending and asset protection using a propensity score matching technique. Findings' of this study indicated that productive safety net programme intervention enabled programme beneficiary households to retain their productive assets holdings. The programme beneficiary households' asset values exceeded that of the non-beneficiary households and increased their livestock holdings. Furthermore, the per capita consumption spending of the programme beneficiary households was higher than that of the non-beneficiary households. Thus, the productive safety net programme enabled programme beneficiary households to retain their livestock holdings.

A study by Andersson et al. (2009) analysed the impact of the productive safety net programme on livestock and tree holding of rural household in Ethiopia using panel data. The data were analysed by both regression analysis and propensity score matching. This study's findings revealed that the number of trees planted increased for the programme participants, but there was no increment in livestock holding as a result of programme participation. Similarly, Nigussa and Mberengwa (2009) evaluated the challenges of productive safety net programme. Findings' of this study pointed out that programme participants possessed very low productive asset holdings and most of them were of very poor quality. This study's results revealed that the programme did not have a positive impact on households' assets holding and consumption spending. Furthermore, findings of this study indicated that programme participants remained poor, their domestic assets were limited and their estimated values were relatively low. Moreover, this

study's results revealed that the relevance of the high magnitude of poverty of the respondents and the community as a whole.

Gillingan et al. (2009) evaluated the impact of productive safety net programme conducted using a panel data (2006, 2007, and 2008) in Amhara, Oromia, Tigrai, and SNNP regions of Ethiopia. Results of this study revealed that the programme had modest effects on households' food security. Thus, the programme improved beneficiary households' food security by 0.40 months and increased growth in their livestock holdings by 0.28 TLU. On average, programme beneficiary households who received relatively high levels of transfers had a 14.3 percent higher growth rate in the value of their livestock holdings. Moreover, this study findings' indicated that compared to non-beneficiary households, programme beneficiary households observed that their welfare has been significantly improved. In the same way, Barnes (2008) has noted that productive safety net programme stabilised and greatly improved the lives of millions of people in Ethiopia. As intended, community assets were being built, livelihoods were being protected and improved and the normal annual food gaps were filled. Devereux et al. (2006) indicated that 75 percent of productive safety net programme participants consumed relatively more food and 60 percent of programme participants avoided selling of their productive assets. This study's results further indicated 62 percent of programme participants reported being effectively protected against distress sales of assets for essential purchases, while 23 percent even increased their asset ownership over the year.

In conclusion, some of the reviewed studies revealed that productive safety net programme had a strong and positive significant impact on rural households' asset holdings (or livestock holdings) and consumption spending while other studies found that the programme had a negative effect on households' asset accumulation and/ or consumption spending. However, none of these studies examined the impact of PSNP on households' poverty alleviation and level of poverty variations across gender headship.

4. METHOD AND DATA SOURCE

Primary cross-sectional data using questionnaire were collected in May 2019. A four-stage sampling procedure was implemented. In the first stage, the eastern zone of Tigrai was selected based on rural PSNP coverage by REST and government parts. In the second stage, five woredas (districts) were purposively selected, of this three from REST administered woredas and two from government-administered woredas. In the third stage, two Kebelles (villages) from each selected woreda were randomly selected from the list of Kebelles with active productive safety net programmes. Finally, as indicated in Table 1, a total 650 representative households, 58.50 percent programme participants (32 percent of them was headed by women) and 41.50 percent non-participants (25 percent of them was headed by men) were drawn on probability proportional to sample size using systematic random sampling method. The sample size was computed by using Yamane (1967) formula, which was calculated as follows: $n = \frac{N}{1+N(e)^2}$.

Where: n is the sample size, N is the population size (1,825), and e is level of precision (i.e., 5 percent point). A 95 percent confidence level and P = 0.5 were assumed while computing sample size.

Table 1. Sample size by woredas and REST and government-administered households

List of Woredas	REST-administered		Government-administered		Subtotal
	Treated	Controlled	Treated	Controlled	
Ganta-Afeshum	65	50	-	-	115
Kilte-Awlaelo	75	60	-	-	135
Hawzen	70	45	-	-	115
Astbi-Womberta	-	-	85	65	150
Saesi-Tsaedaemba	-	-	80	55	135
Total	210	155	165	120	650

4.1 Data Analysis

The data were subject to both descriptive and inferential analysis such as Foster, Greer and Thorbecke (FGT) index and Propensity Score Matching (PSM) to measure poverty status and impact of rural productive safety net programme on poverty reduction, respectively.

4.2 Impact Assessment Analysis

The simplest way of evaluating the impact of rural productive safety net programme on poverty reduction would be to compare the average outcomes of the programme beneficiary households (treated households) and the non-beneficiary households (controlled households). The outcome variable of interest (dependent variable,) is programme participation, which is a binary outcome variable that takes a value of 1 and 0 otherwise. Assessing the impact of any intervention requires making an inference about the outcomes that would have been observed for programme participants had they not have been participated. The appropriate evaluation of the impact of a programme entails identifying the average treatment effect on the treated (ATT), which is defined as the difference in the outcomes between treated households and their counterfactual. The counterfactual refers to what would have happened to the outcome of programme participants had they not have been participated (Becker & Ichino, 2002; Gilligan et al., 2008; Rosenbaum & Rubin, 1983).

One technique is to match programme beneficiary households a subsample of similar non-beneficiary households using a matching method known as Propensity Score Matching (PSM). This technique chooses households as a comparison group based on their similarity in observable variables that are correlated with the probability of being in the programme and, in some cases, with the outcome. All matching technique measures the impact of a programme as the average outcome difference for beneficiary households (treated households) and the average of outcome differences for non-beneficiary households (controlled households). In estimating PSM, the outcome variable of interest (dependent variable) employed was participation in productive safety net programme, which was measured by the households' real consumption expenditure per adult equivalent. Accordingly, let Y_i^{RPSNP} be the outcome of the ith programme beneficiary households and let $Y_i^{Non-RPSNP}$ be the outcome of the ith non-beneficiary households. For each household, only Y^{RPSNP} or $Y^{Non-RPSNP}$ is observed, which leads to a missing data problem. Thus, the impact of productive safety net programme is given by $ATT_{PSM} = Y_i^{RPSNP} - Y_i^{Non-RPSNP}$. However, only Y_i^{RPSNP} or $Y_i^{Non-RPSNP}$ is realized for each household.

Let us D_i denotes programme participation indicator, which is equal to 1 if the household is programme beneficiary ($D_i = 1$) and 0 otherwise. Similarly, let X_i denotes a vector of observed individual characteristics used as conditioning variables. Also, the two basic assumptions, namely õconditional mean independenceö $(E(Y_i^{Non-RPNSP}|X, D = 1) = E(Y_i^{Non-RPNSP}|X, D = 0)$ and the estimated propensity scores should lie between zero and one ($0 > P(X) < 1$, for all X). Thus, the average impact of the treatment on the treated (ATT) was computed as follow:

$$ATT_{PSM} = E_{P(X)}\{E(Y^{RPSNP}|D = 1, P(X)) - E(Y^{Non-RPSNP}|D = 1, P(X))\} \quad [01]$$

Propensity score matching constructs a statistical comparison group by matching observations on beneficiary households to observations on non-beneficiary households with similar values of propensity scores, P(X). The perception is that two individual households with the same probability of programme participation will show up in participants and non-participants samples in equal proportions based on the estimated propensity scores. The researcher constructed a separate impact estimates of the impact of productive safety net programme (RPSNP-supported public works beneficiary households) for REST-administered and government-administered beneficiary households as well as at an aggregate level.

4.3 Poverty Analysis

The poverty situation of the productive safety net programme participants and non-participants was computed using the expenditure approach, the one developed by Foster, Greer, and Thorbecke (1984) a commonly applied for poverty analysis known as FGT index. Separate food and total poverty lines were developed for the study area using the Cost of Basic-Need approach (CBN) as proposed by Revallion and Bidani (1994). To identify the poor and the noon-poor households, the poverty level was computed based on consumption indicator of welfare (or wellbeing) and defines poverty in terms of the households' consumption expenditure per adult equivalent per annum. The three measures of poverty indices in FGT index were employed, namely, headcount index (P0) that depicts the number of the population who are poor, poverty gap index (P1) that measures the extent to which individuals fall below the poverty line (poverty gaps) as a proportion of poverty line, and poverty severity index (P2) demonstrates not only the poverty gap but also the inequality among the poor (WBI, 2005).

Let Z is the poverty line, Y_i is the actual expenditure (per adult equivalent per annum) of individuals below the poverty line, n is the number of people, q is the number of poor people normally those below the poverty threshold, α is poverty aversion parameter and is a value given (0, 1, or 2) to determine the degree to which the measure is sensitive to the degree of deprivation for theses below the poverty line and higher values of α shows greater weight is placed on the poorest section of the society. Thus, the FGT index (or P_α) was computed as follows:

$$P_\alpha(Z,Y) = \frac{1}{n}\sum_{i=1}^{q}\left[\frac{Z - Y_i}{Z}\right]^\alpha \quad [02]$$

Therefore, if the value of $\alpha = 0$, the FGT or the P_α becomes the headcount index (P_0), which measures the share of the population whose consumption expenditure is below the poverty line or the share of the population that cannot afford to buy a basic basket of goods. When $\alpha = 1$, P_α is the poverty gap index (P_1), which measures the number of poor below the poverty line. And when $\alpha = 2$, P_α becomes poverty severity index (P_α) that measures not only the poverty gap but also the inequality among the poor. Accordingly, a separate poverty analysis was made both for REST-administered and government-administered RPSNP-supported public works households and then, using treated and controlled rural households, separate as well as an aggregate the impact of productive safety net programme on householdsø poverty reduction was evaluated.

4.4 Impact of productive safety net programme on gender disparity in poverty

Decomposition analysis of disparity in an outcome of variable of interest is vital for understanding the major determinants of disparity in an outcome of variable of interest and for policy analysis. One of the most common techniques employed to identify and quantify disparity in an outcome of variable of interest or group differences in the labour market, health, and other outcomes is the Oaxaca-Blinder decomposition (Blinder, 1973; Oaxaca, 1973). The Oaxaca-Blinder decomposition aims to explain the distribution of the outcome variable in question by a set of determinant factors that vary systematically with socioeconomic status (Oaxaca 1973; O'Donnell et al. 2008). In the present study, this reveals how the gaps in poverty level between men and women can be explained by the variations in determinant factors (O'Donnell et al., 2008). The Oaxaca-Blinder decomposition, however, is not appropriate if the outcome variable of interest is binary, such as poverty level (Fairlie, 2005). Hence, the extension of the Oaxaca-Blinder decomposition technique was used, which is appropriate for binary models to decompose the gender variations in poverty level into contributions that can be attributed to different determinant factors (Fairlie, 2005).

Thus, according to the Fairlie (2005), using the coefficient estimates from logit regression for the pooled sample, $\hat{\alpha}^*$, the individual independent contribution of X_i to the gender variations in poverty level was computed by:

$$\overline{Poverty}^{Male} - \overline{Poverty}^{Female} = \frac{1}{N^{Female}} \sum_{i=1}^{Female} F\left(\hat{\alpha}^* + X_{1i}^{Male}\hat{\alpha}_1^* + X_{2i}^{Male}\hat{\alpha}_2^* \right) - F\left(\hat{\alpha}^* + X_{1i}^{Female}\hat{\alpha}_1^* + X_{2i}^{Male}\hat{\alpha}_2^* \right)$$

[03]

The contribution of each covariate (independent variable) to the gender gaps in poverty rates is thus equal to the changes in the average predicted probability from the replacing male distribution with female distributions while holding the distribution of all other independent variables constant.

4.5 Variables

The dependent variable employed in the regression-based Oaxaca-Blinder decomposition analysis was households' participation in the productive safety net programme that was measured by the households' real consumption expenditure per adult equivalent. The independent variables include exposure to mass media, motherø education, fatherø education, motherø working

status, dependency ratio, household head∅s age, farm size, household size, access to irrigation, livestock holding in TLU, and off-farm income.

5. RESULTS AND DISCUSSION
5.1 Descriptive Analysis

Of the total 650 sample households, about 57.7 percent (375) of them was programme participants (56 percent REST-administered households versus 44 percent government-administered households). Whereas the remaining 42.31(275) of them were non-participants (56.36 percent REST -administered households versus 43.64 percent government-administered households). Of the total samples, about 58.50 percent was programme participants (men head the majority of programme participants, 68 percent) while the remaining 41.50 percent was non-participants (women head the majority of non-participants, 75 percent). The average age (both mean and median) of the total households surveyed was 63 years old, with the oldest being an 85-year-old man. Similarly, the average household size was five people per household, which is a bit higher than the national average household size (4.6 people per household) (CSA, 2016). Moreover, the average farm size of the sample was 0.75 hectare, which is lower than the national average (0.96) and the regional average farm size (0.91) (CSA, 2012).

5.2 Findings of Poverty Analysis

The incidence of poverty was analysed using the total poverty line and the food poverty line. The cost of basic-needs approach was employed to estimate the poverty line for the data collected. The consumption expenditure approach was used to estimate the poverty line. To compute poverty line, a "basket of food items typically consumed by the local society was identified and computed in such a way that the given bundle meets the predetermined level of the minimum caloric requirement (i.e. 2200 kilocalorie per day per adult) (WHO, 1989). Thus, computed food and total poverty lines were Ethiopian Birr 1011, and 1241 per adult equivalent in nominal terms, respectively (see Table 2, and 4). About 24 percent of households were living below the poverty line, with the poverty gap and severity index of 5.9 and 3.5 percent, respectively. There were significant variations in poverty indices across woredas (districts). Accordingly, the highest poverty incidence (29.6 percent) was observed in Saesi-Tsaedaemba woreda, with 12.7 and 6.2 percent of the poverty gap and severity index, respectively. The lowest incidence of poverty (19.8 percent) was observed in Ganta-Afeshum woreda, with 3.2 and 1.00 percent of the poverty gap and severity index, respectively.

Table 2. Analysis of poverty by woreda (districts)

Woreda (district)	Poverty estimates			Total poverty line
	P_0	P_1	P_2	
Ganta-Afeshum	0.198(0.015)	0.032(0.024)	0.010(0.002)	
Kilte-Awlaelo	0.204(0.020)	0.043(0.015)	0.015(0.003)	1241
Hawzen	0.210(0.011)	0.045(0.023)	0.019(0.002)	
Astbi-Womberta	0.232(0.014)	0.166(0.014)	0.027(0.002)	
Saesi-Tsaedaemba	0.296(0.015)	0.127(0.025)	0.062(0.006)	
Full sample	0.233(0.007)	0.061(0.002)	0.026 (0.001)	1241

Source: Author's computation based on survey data (2019)

Note: Values in parenthesis are standard deviations

5.3 Gender and Poverty

Table 3 presents a gendered disaggregation and households administration (REST-administered versus government-administered households) of the headcount indices (P_0), poverty gap (P_1), and severity index (P_2) estimates. There were significant differences in poverty rates across gender and productive safety net programme administration in the Eastern zone of Tigrai, Ethiopia. Female-headed households had a higher probability of being under the poverty line than male-headed households. Poverty headcount for female-headed and male-headed households was 31 and 21.2 percent, respectively. Poverty gap reflected quite closely the pattern found with headcount index. For female-headed households, for instance, the cost of eliminating poverty was 8.4 percent of the total poverty line per household compared to 4.3 percent for male-headed households' counterparts. The results for the severity indices were consistent with the trends found with the other indicators. Thus, the overall poverty estimates differed significantly by gender, which was much higher for female-headed households than their male-headed counterparts. Most previous studies on poverty indicated that the probability of falling female-headed households into poverty is much greater than male-headed households (Okojie, 2002; Afera, 2017).

Table 3: FGT indices by productive safety net programme administration and gender

Outcome variables	Total poverty estimates			P-value
	P_0	P_1	P_2	
By RPSNP types: RESR	0.203(0.013)	0.057(0.004)	0.021(0.0012)	0.0132[***]
Government	0.332(0.039)	0.078(0.011)	0.039(0.0026)	
Female-headed households	0.311(0.0021)	0.084(0.0051)	0.032(0.0023)	
Male-headed households	0.212(0.0076)	0.043(0.0025)	0.022(0.0011)	0.004[***]
Full sample	0.233(0.0046)	0.161(0.0031)	0.026(0.0010)	

Source: Author's computation based on survey data (2019)
Note: ***Significant at 1 percent & values in parenthesis are standard deviation

Furthermore, there were statistically significant variations in poverty rates between REST-administered and government-administered households. The poverty headcount for REST-administered households and government-administered households were 20.3 and 33.2 percent, respectively. The results of the poverty gap reflected REST-administered households (5.7 percent) was lower than that of government-administered households (7.8 percent). Furthermore, the results for the severity indices for REST-administered and government-administered households were found to be 2.1 and 3.9 percent, respectively. Thus, the overall poverty estimates varied significantly across the groups (REST-administered households versus government-administered households), which were lower for REST-administered households than government-administered households. The possible reasons for the low level of poverty for REST-administered households could be the REST provides services on how to efficiently utilise the transfers that they obtained from the productive safety net programme. Also, the REST encourages households to participate in other income generating activities (such as different off-farm activities) to boost their income level and enhance their poverty level.

5.4 Poverty and rural productive safety net programme

Table 4 presents the results of an analysis of differences in the level of poverty between programme beneficiaries and non-beneficiaries. The resulting poverty indices revealed that the percentage of the overall poor people measured in poverty level (P_0) was 23.3 percent, indicating that this proportion of households live in absolute poverty. This poverty index was nearly close to the national figure reported by NPC (2017) which was 25.6 percent for rural areas. Moreover, the overall poverty gap index (P_1) of the sample households was found to be 16.1 percent. This index captured the average aggregate consumption expenditure shortfall relative to the poverty line and provided information on the budget required to lift the poor households out of poverty. Similarly, the overall poverty severity index (P_2) was found to be 2.6 percent, implying a slight variation within the poor households. This poverty severity index (2.6 percent) was a bit lower than the national average poverty severity index (2.8 percent) in Ethiopia (NPC, 2017).

This study's findings revealed that there was a statistically significant difference in the level of poverty between the programme beneficiaries and non-beneficiaries. Accordingly, the result revealed that the poverty level of the programme beneficiaries was 21.1 percent while that of the non-beneficiaries was 30.33 percent. The poverty gap index of programme beneficiaries was 5.6 percent while it was 6.6 percent for non-beneficiaries. This poverty gap index captured the average aggregate consumption expenditure shortfall relative to the poverty line and provided information on the budget required to lift the poor households out of poverty. Moreover, the overall poverty severity index for programme beneficiaries (2.2 percent) was 1.3 percent lower than non-beneficiaries (3.5 percent) based on the total poverty line estimate. Similarly, the poverty severity index for programme beneficiaries was 2.2 percent while it was 3.3 percent for non-beneficiaries. The findings of the analysis using food poverty line estimates reflect the same phenomenon (see Table 4).

Table 4. Differences in the level of poverty by programme participation

Outcome variable	Total poverty estimates			TPL	Food poverty estimates			FPL
	P_0	P_1	P_2		P_0	P_1	P_2	
beneficiaries	0.2110	0.056	0.022		0.221	0.041	0.021	
Non-beneficiaries	0.3033	0.066	0.035	1241	0.320	0.055	0.027	1011
Full sample	0.233	0.161	0.026		0.283	0.053	0.020	
Pearson chi2(1) = 0.2421 Pr = 0.201					Pearson chi2(1) = 3.132 Pr = 0.013**			

Source: Author's computation based on survey data (2019)
*Note: **Significant at 5 percent; TPL=total poverty line; and FPL=food poverty line*

5.5 Households' Consumption Spending

Table 5 presents the average consumption spending per adult equivalent and its percentage share. The households' consumption spending was used as impact indicator while evaluating the impact of productive safety net programme on households' poverty reduction, and it was computed as per adult equivalent consumption spending (food consumption per adult equivalent, non-food consumption per adult equivalent, and total consumption per adult equivalent). The consumption spending is defined as the sum of values of all food items, including purchased meals, and non-food items. Thus, per adult equivalent consumption spending is defined as per capita

consumption spending adjusted for age and gender of household members obtained by dividing the household consumption spending to total adult equivalent. The overall average consumption spending per adult equivalent for the sample households was Ethiopian Birr 1328.06. The average consumption spending for programme participants and non-participants were Ethiopian Birr 1282.76 and 843.36, respectively (based on December 2006 constant price). The overall average share of food and non-food consumption spending were found to be 66.26 and 33.74 percent, respectively. The average share of food in total consumption was lower for programme participants (67.64 percent) than for non-participants (70.29 percent), indicating that the programme participants are transformed. Moreover, the average share of non-food consumption for programme participants and non-participants were found to be 32.36 and 29.71 percent, respectively. These findings were similar to other previous studies (Bogale and Genene, 2012).

Table 5. Comparison of average consumption spending per adult equivalent

Types of spending	Participants Mean	Non-participants Mean	Total Mean	t-value
Food consumption spending	867.71(308.7)	592.84(385.59)	880.28(346.02)	-3.78**
Non-food consumption spending	415.05(201.8)	250.52(264.54)	447.78(206.47)	
Total consumption spending	1282.76(234.8)	843.36(368.38)	1328.06(314.10)	2.62***
Share of food consumption spending (%)	67.64	70.29	66.26	
Share of non-food consumption spending (%)	32.36	29.71	33.74	

Source: Author's computation based on survey data (2019)
*Note: The asterisks (**, & ***) indicate significance at 5 & 1 percent level, respectively; the standard deviation is given in parenthesis*

5.6 Impact of productive safety net programme on households' consumption spending

Before estimating the average treatment effect on the treated, the region of common support [.00150281, .91305148] was estimated. Concurrently, test of balancing property of the propensity score was performed and it was satisfied, indicating they were not different for the treated and control groups.

Table 6 presents the results of the average treatment effect on the treated (ATT) for the productive safety programme beneficiary households and the non-beneficiary households. Accordingly, the result of this study revealed that on average, the productive safety net programme beneficiaries consumed relatively more food items as compared to the non-beneficiaries. The difference in the mean value of food consumption per adult equivalent between programme beneficiaries and the non-beneficiaries was found to be positive and statistically significant (ATT = Ethiopian Birr 1254.39 per adult equivalent). Therefore, the majority of productive safety net programme beneficiaries consumed relatively more food items. A study conducted by Gilligan et al. (2008) found out that positive impact on per capita food expenditure and this was statistically significant for programme beneficiary households. Thus, the programme beneficiaries were more likely to consume more food as compared to non-beneficiaries counterparts in terms of per adult equivalent consumption. The estimated total consumption expenditure per adult equivalent for programme beneficiaries was found to be

higher as compared to non-beneficiaries counterparts (ATT = Ethiopian Birr 2105.51 per adult equivalent). The estimated results indicated that the average total consumption expenditure per adult equivalent for programme beneficiaries was positive and statistically significant. The principal results of the study of the regression analysis indicated that the programme intervention enabled productive safety net programme beneficiaries to significantly enhance their consumption expenditure. A study conducted by Devereux et al. (2006) noted that 75 percent of productive safety net programme beneficiaries have been reported that they consumed more food of better quality. Moreover, Barnes (2008) also noted that rural productive safety net programme has a positive and statistically significant impact on households' consumption expenditure. Furthermore, findings revealed that total consumption expenditure per adult equivalent for the REST-administered beneficiaries was three times higher than government-administered beneficiaries. Similarly, this study's findings indicated that food consumption expenditure per adult equivalent for the REST-administered beneficiaries was almost twice that of government-administered beneficiaries. The productive safety net programme is a social safety net that is a transfer in itself does not reduce poverty sustainably, because it is not a livelihood enhancing intervention. However, it might interact positively with other entitlement categories.

Table 6. ATT estimation results of the impact of productive safety net programme on households' consumption

Impact of RPSNP on households' consumption for REST-administered households					
Outcome variable	Matching	No. of participants	No. of non-participants	ATT	t-values
Food consumption per adult equivalent		199	143	1054.39	2.88***
Non-food consumption per adult equivalent	Nearest Neighbour	187	135	369.60	0.39
Total consumption per adult equivalent		187	135	1254.39	3.31***
Impact of RPSNP on households' consumption for government-administered households					
Food consumption per adult equivalent		159	112	654.39	2.66***
Non-food consumption per adult equivalent	Nearest Neighbour	148	101	248.35	0.72
Total consumption per adult equivalent		148	101	452.45	2.85***
Impact of RPSNP on households' consumption for all households (REST & government)					
Food consumption per adult equivalent		370	265	1254.39	3.02***
Non-food consumption per adult equivalent	Nearest Neighbour	305	201	369.60	0.47
Total consumption per adult equivalent		305	201	2105.51	3.45***

Source: Author's computation based on survey data (2019)
Note: Asterisks (***) indicate significance at 1 percent level; standard deviation is given in parenthesis

5.7 Impact of productive safety net programme on gender disparity in poverty

Table 7 shows the results of decomposing the gender disparities in the poverty level using the Oaxaca-Blinder decomposition approach. The decomposition analysis revealed that there was a significant proportion of poverty rates difference between male and female due to observed characteristics (covariates effect). Accordingly, gender gaps in poverty rates were explained by 47 percent while the remaining 53 percent of the gaps was unexplained, which was attributable to differences in return of these characteristics (coefficients effect). This implies that the significant variations in the poverty rate between male and female remained unexplained. Furthermore, the results of the analysis revealed that the relative contribution of individual decomposed covariates varied substantially in their magnitudes of effect and level of significance while explaining (reducing) or widening the gender disparity in the poverty rate. The household's off-farm income, holding livestock, literate father, Type of productive safety net programme (REST), the dependency ratio, and households' access to irrigation were the major determinants of the gender disparity in the poverty rate. Accordingly, the proportional gender disparity in the poverty rate was largely explained (reduced) by a household's off-farm income. Thus, the results showed that the household's off-farm income reduced the gender disparity in poverty rate by 38 percent. Furthermore, the gender disparity in the poverty rate was reduced by holding livestock in TLU (34 percent), father's education (30 percent), farm size (18 percent), and REST-administered households (13 percent), respectively. On the contrary, the gender disparity in the poverty rate was widened by the dependency ratio, with 26 percent of gaps in the poverty rate. This implies that female-headed households with a relatively high proportion of dependency ratio were in a more disadvantageous situation in terms of the level of poverty. Moreover, the gender disparity in the poverty rate was widened by households' access to irrigation (24 percent), implying that female-headed households who had no access to irrigation were relatively poorer than male-headed households' counterpart. The number of female-headed households who had no access to irrigation was higher than the number of male-headed households. This, in turn, resulted in to have low level of income and led them to fall into poverty compared to male-headed households.

Table 7. Analysis of the gender disparity in poverty using Oaxaca-Blinder decomposition

Detailed Decomposition:	Estimates	Standard Error	Share[a]
Type of RPSNP (REST)	-.00629[**]	.0147	-12.930
Mother's education	.00522[**]	.0074	22.090
Mother's working status	-.03027	.0051	-12.150
Dependency ratio	-.01571[***]	.0289	26.310
Age of household head	-.03664	.0514	-16.270
Father's education	-.00133[**]	.0065	-29.530
Farm size	-.04535[**]	.0211	-18.210
Access to irrigation	.00972[**]	.0068	-23.910
Household size	-.00203	.0066	-11.820
Livestock holding in TLU	.05982[** *]	.0118	-34.020
Off-farm income	-.02022[*]	.0113	-28.120
Distance from health posts in hours	-.21071	.0271	2.1650
Aggregate decomposition			
Explained gap	.2924[*** *]	.0299	47.120
Unexplained gap	.1566[*** *]	.0464	52.880
Total gap[1]	.2491	.3544	100.00

Source: Author's computation based on survey data (2019)
Notes: i) [a] The contribution of each covariate as a percentage of the total explained gaps
*   ii) The relative contributions of individual covariates can be positive (>0 percent) or   negative   (<0 percent). The positive contribution (4th column) of the covariates shows that   particular covariate contributes to widening the gender disparity in poverty rate while the   negative contribution of a covariate designates the opposite.*
*   iii) AE stands for Adult Equivalent*
*   iv) The asterisks (*, **, & ***) indicate significance at 10, 5, & 1 percent level, respectively;   the standard deviation is given in parenthesis*

6. CONCLUSION AND POLICY IMPLICATIONS

This study assessed the contribution of productive safety net programme in reducing households' poverty level in rural settings of Tigrai, Ethiopia. Thus, the productive safety net programme beneficiaries were largely dominated by male-headed households. There were significant variations in the incidence of poverty, poverty gaps, and poverty severity indices across woredas (districts), gender, and types of household administration (REST-administered versus government-administered households). Female-headed households had a higher probability of being under the poverty line than male-headed households. Furthermore, households that received the transfers under REST-administration experienced a much higher improvement in poverty alleviation than households received transfers under government-administration. Moreover, the overall poverty estimates for the productive safety net programme beneficiary was lower than non-beneficiary households. Most importantly, the average share of food consumption per adult equivalent for the programme beneficiary was lower than non-beneficiary households. This could imply that rural productive safety net programme was significantly

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[1] In decomposition analysis, the raw difference in poverty rate across gender can be stated in terms of the overall components (explained and unexplained components) as a sum of weighted sums of the specific contributions of the individual explanatory variables (Powers & Yun, 2009).

effective in reducing households' poverty level and was able to reach the poorest households. Thus, the gender disparity in poverty rates was largely explained by households' off-farm income, livestock holding, father's education, and farm size, while the gender poverty disparity was widened by dependency ratio and households' access to irrigation.

Policies need to be designed and targeted in such a way that the female-headed favouring rural strategy programmes to equip with the necessary skills and knowledge, diversify the income scheme and enable them to bring attitudinal change to consider them as male equivalently involving in all activities. That is, the government needs to be vigilant and design and implement policies that mitigate the rise of inequality between male and female-headed population groupings of the society. Furthermore, to reduce the overall poverty level of the region as well as the country, due attention has to be given to reducing gender disparity in poverty. Moreover, the government-administered productive safety net programme woredas have to share experience from the REST-administered productive safety net programme woredas on how the programme is managed to accelerate the rate poverty reduction.

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