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The impact of social protection intervention on alleviating social vulnerability: Evidence from rural households of Tigrai, Ethiopia

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Abstract

Social vulnerability is a multidimensional challenge found as an important concept used to guide policy evaluation. Yet, there has been a knowledge gap in public intervention implementations. Thus, a study was carried out to analyze the impact of social protection intervention (SPI) on alleviating social vulnerability in the eastern zone of the Tigrai Regional state of Ethiopia. Data were collected through face-to-face interviews with 471 target rural households. Factor analysis and Propensity Score Matching (PSM) methods were applied to construct the Social Vulnerability Index (SVI) and measure the counterfactual impact of selected interventions. Access to basic services such as social affairs, agriculture, health and education sectors, and the Food Security Program (FSP) are used as Social Protection Interventions (SPIs). This study revealed that the households who had access to SPIs have scored 9.65% lower SVI than in the absence of the intervention. This implies that the beneficiaries would have scored 9.6% higher on the SVI compared to in the absence of the intervention. The causal effect of social protection intervention on social vulnerability was found to be negative (-0.096%). Taking the negative coefficient of ATT as empirical evidence, the beneficiary households have scored negatively (Social Vulnerability Index (SVI) compared to the absence of intervention. Social protection interventions aimed at promoting livelihood capacity not only through food security programs but also through basic public services of education, health, and agriculture. However, 9.6% is revealed to have an insignificant impact, taking the joint aim of the entire public intervention. If basic public goods are delivered, proactive public interventions would be customized to break down the intergenerational effect of social vulnerability. Because amplifying effects of exposure

and sensitivity on social vulnerability can be reduced through various public interventions. This study suggests the provision of integrated, proactive, productive, and evidence-based SPIs to alleviate social vulnerability.

Keywords: Social Protection; Livelihood assets, Social vulnerability, Public policy, Social Vulnerability Index.

Introduction

Historically, social protection policies were first introduced in developing countries following the Second World War (Merrien, 2013). In its legal context, the right to social protection was protected in the Universal Declaration of Human Rights (UDHR), which was ratified in 1948, and the International Covenant on Economic, Social, and Cultural Rights, adopted by the United Nations in 1976 (Moyn, 2014). Until the early 1990s, social protection occupied a peripheral place in dominant development thinking, largely because it was viewed as relevant mainly to the social security systems of affluent countries or to contributory social insurance schemes serving workers in the formal sector (Merrien, 2013). To alleviate social vulnerability and bring the poor out of poverty, Ethiopia has been implementing different poverty reduction and food security policies for the last two decades (Degye, 2013).

Ethiopia has shown great progress in improving the state of food security. However, as the economy is dependent on unpredictable rainfall, self-sufficiency and assuring the sustainability of livelihoods remain major challenges for society and the government. The Ethiopian government launched the Food Security Program (FSP) in 2003 and the Productive Safety Net Program (PSNP) in 2005, which provides predictable safety net support to chronically food-insecure people (World Bank, 2017). In comparison to the worldwide coverage (45%), the social protection coverage is found to be lower (17%) in Africa (ILO, 2018) and 8.3% in Ethiopia (World Bank, 2015).

Experts from various disciplines use different definitions of vulnerability, which leads to diverse measurements to serve their purpose and interests (Paul, 2013). The risk-based models for vulnerability emphasize the conceptual link between people and their environment (Nuruzzaman, 2016; Imran et al., 2015; Singh et al., 2014; Sherbinin, 2014). Vulnerability is made up of the characteristics of a person or group and their situations that influence their capacity to anticipate, cope with, resist and recover from the impact of natural hazards (Singh, 2014). The conception

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of social vulnerability mainly focuses on natural hazards and climate change (Gaillard, 2010; Mitchell and Tanner, 2010).

Social vulnerability is a broad concept, encompassing not only income vulnerability but also such risks as those related to health and those resulting from violence and social exclusion, all of which can have dramatic effects on the socio-economic lives of households (Coudouel and Hentschel, 2000). Nevertheless, this study assumes social vulnerability as a function of livelihood capacity, exposure, sensitivity components, and access to rural livelihood assets; public intervention and local public institutions are commonly assumed as social determinants. In Ethiopia, there are some studies (Hoddinott et al., 2018; Wondim, 2018; Adimassu and Kessler, 2015; Yibrah, 2014) conducted on the impact of public interventions at the program level. However, assessing the impact of a single program of social protection is not enough to determine the impact of social protection interventions on alleviating social vulnerability. Impact evaluation is used in policy studies for formative and summative purposes. Besides this, the existing literature on social protection interventions has ignored the role of local public sectors in mitigating social vulnerability. Therefore, pragmatic evidence is needed to analyze the impact of social protection intervention on alleviating social vulnerability in one way and supporting the livelihood capacity of rural households in the other way. This study is devoted to exploring the impact of social protection intervention (SPI) on alleviating social vulnerability in the eastern zone of the Tigrai Regional state of Ethiopia.

Conceptual framework

Despite the National Social Protection Policy (NSPP) of Ethiopia involves many social protection interventions and programs, the scope of this study is limited to four focus areas such as social safety net, livelihood and employment schemes, social insurance, and addressing inequality of access to basic services of social protection and two major programs. Moreover, both Productive Safety Net Program (PSNP) and Households' Asset Building Program (HABP) are combined into FSP and this FSP is supposed as the major social protection intervention to affect the Social Vulnerability condition of rural households (Figure 1).

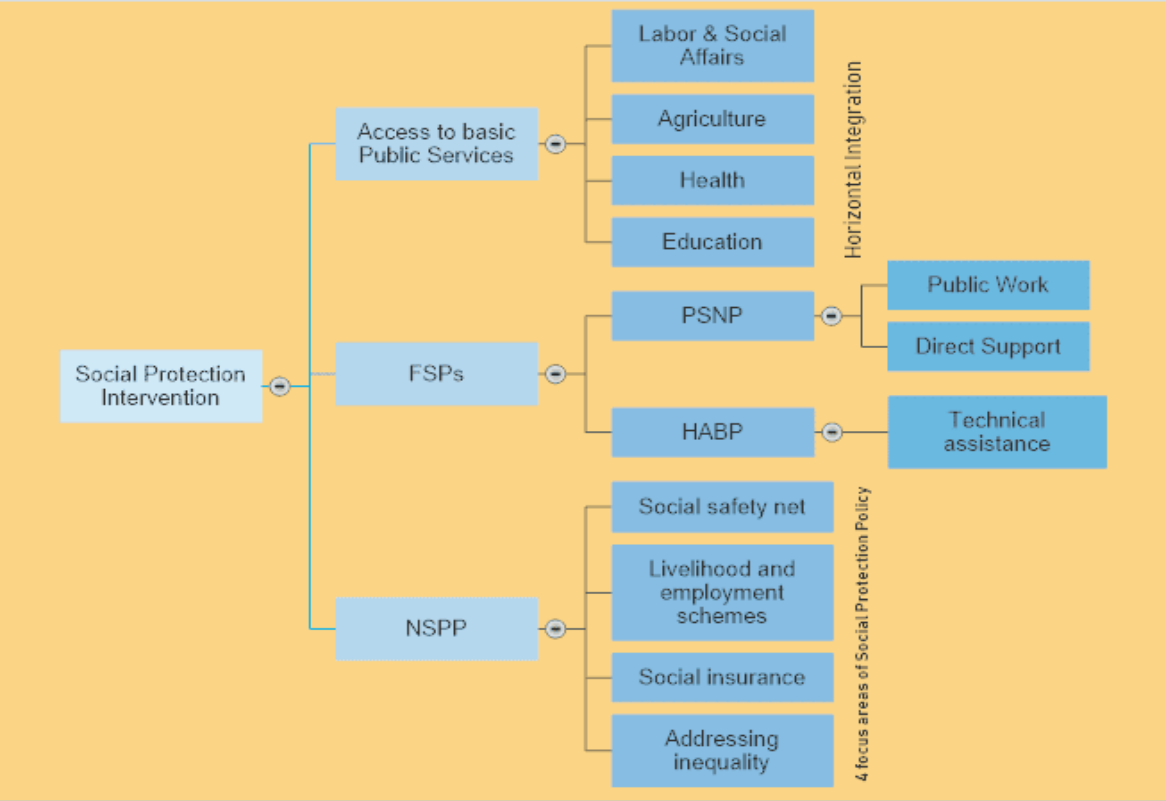

Figure 1. Conceptual framework of the study

Research methodology

Description of the study area

The Tigrai regional state is found in northern Ethiopia, and it is made up of seven administrative zones. According to its geographic and demographic setup, the Eastern zone is drought-prone (Gebrehiwet et al., 2018, and Gebru et al., 2018) and socially insecure in comparison to other zones. The Zone is then divided into eighteen districts. The Eastern Zone is among the seven administrative zones of Tigrai, which is surrounded by the Afar region to the east, the southeastern Zone to the south, the Central Zone to the west, and Eritrea to the north. This zone is among the seven administrative zones of the region, which has been highly suffering from its nearby geopolitical instability and conflicts with Eritrea (Haile and Singh, 2025). The Population and Housing Census report projected the population of the Eastern Zone in 2020 to be 855,343, with a rural share of 80.2% and an urban share of 19.8% of the total population (CSA, 2013). In the same census, the two largest ethnic groups reported in this zone are the *Tegaru* (95.32%) and Erob (3.78%), and other groups have only 0.9% share of the total population. The climate of this zone is classified into three agro-climatic resources: highland, representing 73.4 %; Mid-altitude,

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12.6%; and lowland, 14% of the total area (Desalegn, 2013). Due to its natural situation and topography, the rural lives of this zone are difficult. In spite of the fact that the environment is characterized by unsuitable farming land, deforestation, and less soil fertility, barley, *teff*, wheat, and maize are major cereal crops cultivated in this area. Wild fruit locally called '*BELES*' is common in the summer season. In the winter season, farmers exercise the local irrigation system and produce potatoes, tomatoes, onions, cabbage, green chili, and other vegetables. The environment is characterized by unsuitable farming land, deforestation, and less soil fertility. In this environment, the farming system is traditional, and rain mainly starts from June and ends in mid-September (Haile and Singh, 2025). Geographically, this study is undertaken in four systematically selected rural districts located in Eastern Zone of Tigrai.

Sampling technique and data collection

In a multi-stage sampling technique, the sample size was calculated following the equation suggested by Bryman (2016).

$$n = \frac{NZ_{\alpha/2}{}^2 P(1-P)}{e^2(N-1)+Z_{\alpha/2}{}^2 P(1-P)}$$

From the 11,712 households living in Erob, Ganta Afeshum, Gulo Mekeda, and Hawuzen districts, 581 households were calculated as a sample size, though the questionnaire properly filled and collected reduced the sample size to 471 households. Therefore, primary data were collected from 471 sample rural households through a self-administration questionnaire. To support the validity of data collected through questionnaires, key informant interviews among selected civil servants working in bureaus of labor and social affairs, agriculture, health, and education of each district were conducted.

Based on the structure of the questionnaire, the results on the summary of livelihood capacity, households' access to local public institutions, nature of sectoral integration, and public interventions are presented. The target respondents were requested to rate how they interacted with potential exposure and sensitivity components of social vulnerability using dichotomous questions. To evaluate the impact of policy intervention, this study applied a causal research design, which considered a form of conceptual framework that guides the study of cause-effect relationships (Schrekenberg, 2010). Guo and Fraser (2014) reveal that program evaluation answers the question, ‘’To what extent can the net difference observed in outcomes between

treated and non-treated groups be attributed to the intervention?". In this regard, selected public interventions are collectively considered causes, while social vulnerability is considered an effect. Conceptually, this paper reveals the counterfactual impact of social protection intervention on social vulnerability. Across the counterfactual analysis, the target respondents are divided into treated groups (those who were beneficiaries of selected public interventions) and a control group (those who were non-beneficiaries). Therefore, this theory of policy analysis is used to compare the counterfactual impact of selected public interventions on alleviating social vulnerability and supporting the livelihood capacity of rural households. As it is discussed under the following section, the Average Treatment Effect of the Treated (ATT) is calculated to measure the outcome indicator SVI scored by beneficiaries of selected public intervention compared to how much they would have scored without receiving the benefit.

Data analysis

Model specification

A statistical technique called 'factor analysis' is applied to construct he Social Vulnerability Index (SVI) and Propensity Score Matching (PSM) to measure the counterfactual impact of selected social protection interventions.

Aggregating Livelihood Capacity Index (LCI)

A total of 31 indicators of livelihood assets is reduced to five livelihood capitals and then indexed into one LCI. Factor analysis is used as a variable reduction technique to turn related variables into one composite index. To measure these livelihood assets, a sequential process such as indicator selection, selection of analysis scale, assessment of indicator measurement error, data normalization (UNDP, 2010), scaling, weighting, and aggregation, assumed by Eric (2014), are demonstrated.

$$VI = \frac{Vi - Xmin}{Max - Xmin} \quad (1)$$

Where, VI: Indicator score I, vi: Original score value of an indicator I (I>0) Xmin: The lowest values, and Xmax: The highest value obtained from the households. To calculate the score of each determinant that contributes to each sub-component, Equation 2 is adapted from Nguyen (2015).

$$SC = \frac{\sum_{i=0}^{N} Vi}{N} = \quad (2)$$

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Where, SC: score of sub-components, Vi: average score of determinants i (i>0), N: total determinants (12) in a sub-component. Moreover, Livelihood Capital Index is aggregated using the next linear equation (Sullina, 2002).

$$LCI = \frac{\sum_{i=0}^{N} SCi*ni}{N} \quad (3)$$

Where, LCI: Livelihood Capacity Index, SCi: score of sub-components (capital i), ni: number of determinants in sub-component I, N: Total livelihood capitals (5). Besides this, Nine and Ten indicators are respectively used to construct sensitivity and exposure components. Finally, three subcomponent indexes namely livelihood capacity index, exposure index, and sensitivity index are combined to create an aggregated SVI.

$$SVI = EI*SI*(1-LCI) \quad (4)$$

Where, SVI stands for Social Vulnerability Index; EI stands for Exposure Index; SI stands for Sensitivity Index, and LCI stands for Livelihood Capacity Index that measures the adaptive ability of an HH to cope with or recover from various shocks. Following the Sustainable Livelihoods Framework (SLF), this study is summarized into vulnerability context, livelihood asset analysis, and estimates households' level of social vulnerability.

Propensity Score Matching (PSM)

To estimate the counterfactual impact of an intervention on alleviating social vulnerability, this study applies to a non-experimental statistical method called PSM. After being introduced by Rosenbaum and Rubin (1983), PSM is more common in economics and medical research. It is an algorithm that matches participants and non-participants based on the conditional probability of participation given the observable characteristics (Li, 2012). In a simple definition, PSM is an alternative method of observing the differences between the beneficiaries and non-beneficiaries of a particular intervention. The key objective of the PSM is to replace many confounding covariates in an observational study with one function of these covariates (Li, 2012). It is worth noting that PSM helps to compare factual scenarios with the counterfactual scenarios. By definition, the counterfactual scenario cannot be observed, because it is defined as what did not happen (Hub, 2019). The function captures the likelihood of FSP participants receiving a treatment based on observed covariates. The estimated propensity score is then used as the only confounding covariate to adjust for all of the covariates that go into the estimation. Generally, propensity score modeling always begins with the estimation of the conditional probability of

receiving or not receiving the treatment (Guo and Fraser, 2014). Then, followed by stratification of propensity scores, calculation of treatment effect using an appropriate method of statistical matching, and conducting sensitivity analysis to justify that the estimated ATT is robust (Li, 2012). Statistically, the above reasoning can be summarized using the following binary logit regression.

$$P(x) = Pr(T = 1 \mid x) \quad (5)$$

Where P(x) denotes to Propensity score; Pr is a probability, T is the potential outcome 1 for beneficiaries and 0 otherwise, "|" sign stands for conditional on and x refers to set of covariates which indicate for pre-intervention characteristics of the households. Using the Nearest Neighbor Matching (NNM) algorithm, the beneficiaries are matched with non-beneficiaries who scored the closest propensity score. The impact of FSP for household i, noted δi, is defined as the difference of potential outcome between the presence and absence of the intervention.

$$\delta i = Y^1 - Y^0 \quad (6)$$

Equation 4.2.3 seeks to evaluate the average effect of FSP on SVI obtained using Average Treatment Effect (ATE): $ATE = E(\delta i) = E(Y^1 - Y^0)$ (7)

In this case, ATE is defined as the average effect that would be observed if everyone in the treated and the control groups received treatment, compared with if no one in both groups received treatment (Li, 2012; Harder et al, 2010). To minimize the possibility of biasness and to estimate the possible impact of FSP on mitigating the social vulnerability of the beneficiary households; equation 8 is derived from Heckman et al. (1997).

$$ATT = E(Y^1 - Y^0 \mid D = 1) = E(Y^1 \mid D = 1) - E(Y^0 \mid D = 1) \quad (8)$$

Where E denotes for the Expected value, ATT for Average Treatment effect on the Treated, Y^1 is the potential average SVI of the beneficiary, Y^0 is the potential average SVI of non-beneficiary, D is dummy variable for treatment status equal to 1 if the household receives the benefit and 0 otherwise. The evaluation problem arises from the fact that the non-beneficiary outcome for a beneficiary individual, $E(Y^0 \mid D = 1)$, can never be observed. Alternatively, Guo and Fraser, (2014) and Heckman et al, (1997) note that the evaluation of $E(Y^1|D = 1) - E(Y^0|D = 0)$ can be understood as an effort that uses $E(Y^0|D = 0)$ to estimate the counterfactual value of $E(Y^0|W = 1)$. Besides this, Ahmed (2010) assumes that the non-participants (D=0) are eligible for the program and did not participate which implies conditional (|) on the potential covariates. The central interest of the evaluation is not in the factual value of $E(Y0|D = 0)$ but in the counterfactual mean

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of $E(Y0|D = 1)$. ATT is the most common counterfactual impact indicator of interest (Essama, 2006). In this study, ATT measures the outcome indicator SVI scored by beneficiaries of FSP compared to how much they would have scored without receiving the benefit. Moreover, the statistical T-test is applied to measure the statistical significance of the mean difference of SVI between beneficiaries and non-beneficiaries.

Results and discussion

Demographic and socio-economic profile of the respondents

The demographic profile of the studied households shows that males constitute a slightly higher proportion (53%) compared to females (47%). In terms of education, the majority of respondents have attended elementary school (54%), followed by those with secondary education (20.6%), while only a small fraction reached college level and above (3.8%), indicating generally low levels of higher education. Most households live with their families (89%), with only a small proportion residing elsewhere (11%). Among those living away, the majority are still within Ethiopia (72%), compared to those living abroad (28%). Regarding household members living elsewhere, sisters (27%) and brothers (25.9%) make up the largest shares, followed by fathers (24.4%), while mothers (4.5%) and others (3%) represent much smaller proportions. The main reason for living elsewhere is employment (33.4%), which is notably higher than other purposes such as education (18%) and military service (15.7%), suggesting that economic factors are the primary driver of mobility among household members (Table 1).

Table 1. Demographic profile of the studied households

Variables	Category	Frequency	Percentage
Gender	Male	1,214	53.0
	Female	1,085	47.0
Education level	Children	208	9.0
	Illiterate	264	11.5
	Elementary School	1,248	54.0
	Secondary school	475	20.6
	College and above	88	3.8
Living arrangement	With family	2,048	89.0
	Somewhere else	266	11.0
Location of residence	in Ethiopia	191	72.0
	Outside Ethiopia	75	28.0
Household members living elsewhere	Fathers	65	24.4
	Mothers	12	4.5
	Sisters	72	27.0
	Brothers	69	25.9
	Others	8	3.0
Major purposes for Living elsewhere	Employment	89	33.4
	Military service	42	15.7
	Education	48	18.0
	Other purposes	9	3.38

The non-beneficiaries were scored with relatively better-off livelihood capacity on selected economic indicators as shown in Table 2. The mean values of selected indicators indicate that the beneficiaries had fewer rooms, held a fewer number of oxen, had a lower size of farming land in hectares, had a lower livestock capacity, and were characterized by lower annual cereal productivity in comparison to the non-beneficiaries. From this result, it can be concluded that the poor households were targeted as beneficiaries following the minimum eligibility criteria, which are specified under the PSNP implementation manual.

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Table 2. Socio-economic profile of beneficiaries and non-beneficiaries of FSP

Selected socio-economic variables	Beneficiaries [172]		Non-beneficiaries [299]		Mean difference
	Mean	Std. Deviation	Mean	Std. Deviation	
Number of rooms	2.35	0.74	2.41	0.79	-0.06
Quantity of oxen	1.01	0.74	1.41	0.70	-0.4
Size of own farming land in hectare	1.226	0.64	1.38	0.789	-0.154
Estimated livestock capacity in Birr	23538.37	13571.46	32697.4	16508.21	-9159.03
Estimated annual income from cereal in Birr	7459.04	6057.28	8649.1	8555.10	-1193.06
Estimated annual income per household from all sources in Birr[1]	42467.31	16537.16	47959.2	21230.32	-5491.89

Basic public interventions

In the Ethiopian public management context, social protection intervention is the major mandate of the Ministry of Labor and Social Affairs (MoLSA). As stated in the National Social Protection Policy (NSPP), this ministerial sector has the legitimate power and responsibility to deliver basic social protection interventions through its regional, district, and village-level wings to protect the welfare of the people in collaboration with other public and private stakeholders. Hence, the evidence concerning target households' access to selected public intervention and local public sectors such as labor and social affairs, agriculture, health, and education is comparatively analyzed under this section.

Access to food security programs (FSPs)

The respondents were asked whether they participated in the direct support or public work form of FSP. The results regarding the self-reported form of intervention, the number of beneficiaries per household, and the monthly amount of transfer are presented in Table 3. According to the implementation manuals of the Food Security Program (FSP) and PSNP, the labor force, livelihood capacity, and cause of food insecurity are among the minimum eligibility criteria to select the target beneficiaries either under direct support or the public work form of interventions. For instance, poor rural households are targeted for direct support if they do not have adult members who could participate in public works. Consequently, in their form of support, 124 (73.8%) beneficiaries belonged to PSNP (direct and public work), while 44 (26.2%)

[1]At official exchange rate, 1 US Dollars was equivalent to 29 Ethiopian Birr, despite the rate in black market varies from Birr 50 to 60 depending on the location.

respondents belonged to HABP. HABP provides diversified technical assistance to target beneficiaries. The technical assistance focuses on farming capacity building (Berhane, 2011) and supports members to get credit access from various financial institutions (MoLSA, 2016). In all forms of interventions, between 2 and 3 people are reported as average beneficiaries per household. Furthermore, the target beneficiaries in public works and direct support located in the Hawuzen district have been paid the highest monthly equivalent asset transfer of 1076 Birr and 791 Birr, respectively. Due to inflation in food prices, the average value of transfer in all districts of this survey is found to be nearly twice the average value of transfer (Birr 316.8) revealed by Teshome (2016).

Table 3. Forms of intervention and number of beneficiaries per household

Forms of intervention	Erob		Ganta Afeshum		Gulo Mekeda		Hawuzen		Total
	Freq.	Transfer	Freq.	Transfer	Freq.	Transfer	Freq.	Transfer	Freq.
Direct support	6	632	5	540	21	785.5	15	791	47
Public work	14	903	17	768	26	897	20	1076	77
Technical assistance	10	-	13	-	11	-	10	-	44
Total/Average	30	767.5	35	654	58	841.25	45	933.5	168

NB: The average transfer was supposed to be 15Kg of grain + 3Kg of pulse + 1.5 litter of oil per Month per beneficiary if paid in food (personal interview, 2018) and the value of food transfer is calculated through 16 Birr/kg as the average price for grain, 26 Birr/Kg for pulse and 30 Birr/litter for oil.

Protective, preventive, and promotive impacts are underlined in the National Social Protection Policy as the major outcomes of the social protection intervention. Figure 2 summarizes the perception of the beneficiaries on the impact of public interventions on their livelihood capacity. So, while the program had a protective impact on the livelihood capacity of 80 beneficiaries, it had preventive and promotive impacts on 39 and 42 households, respectively. However, very few (7) target respondents believed that the program was encouraging food dependency. From the perception of the majority of beneficiaries located in each district, one can conclude that these public interventions have been successfully achieving their expected outcomes. In contradiction to this, the practice of PSNP in the Bale Zone of the southeast part of Ethiopia was characterized by a lack of monitoring and evaluation of structures, low payment, and limited awareness of beneficiaries (Welteji et al., 2017).

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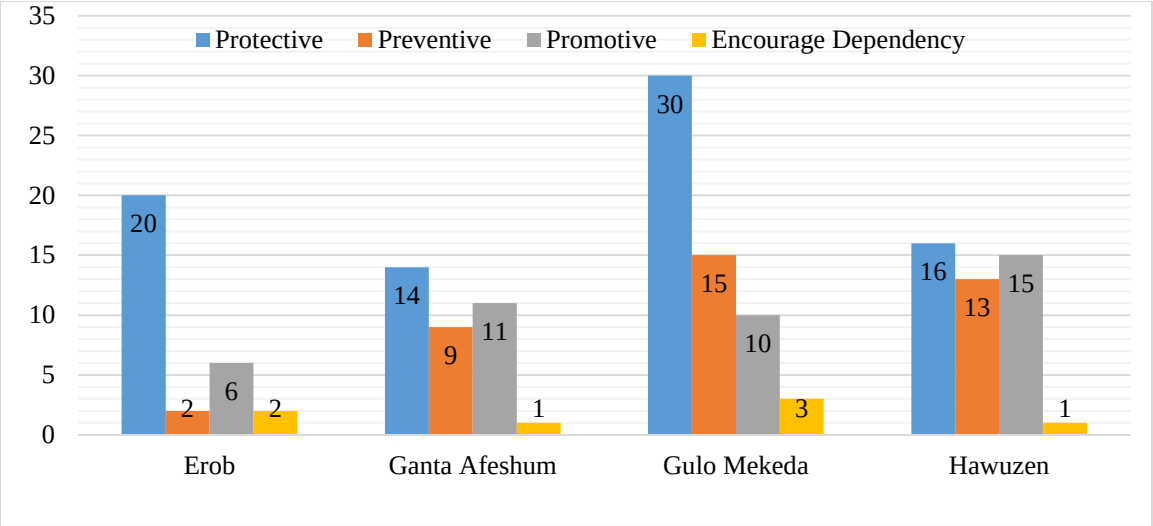

Figure 2. District-wise beneficiaries' perception on the impact of the intervention

The respondents were asked the reason why they had no access to FSP support (Figure 3), and among 299 non-beneficiaries, 101 (33.1%) respondents believed that it was because of the unjust decision of the committees, while 90 (30.1%) respondents replied that they have graduated before this survey. Moreover, while 74 (24.7%) respondents mentioned other reasons, only a few, 34 (11.4%), non-beneficiaries were found to have relatively better livelihood capacity than other households. As far as the witness shared by the informant, public servants' limited quota allocated to their districts, and limited knowledge of households' livelihood capacity are reported as the major obstacles affecting the performance of social protection schemes. Overall assessment, Welteji et al. (2017) reveals wrong inclusion and exclusion of beneficiaries, poor monitoring management, low level of cooperation of concerned officials, and absence of manpower in remote areas among the challenges commonly faced during the implementation of FSP.

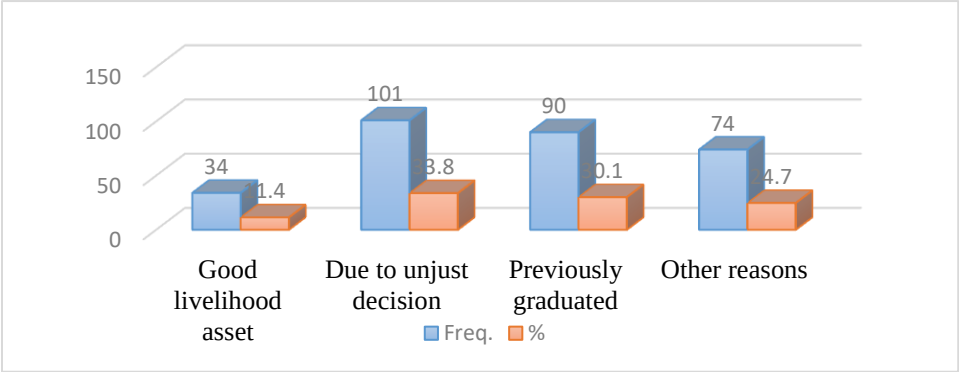

Figure 3. Reason for no benefit from any FSP

In addition to the comparative socio-economic profile (Table 1) of the respondents and the major reasons why the majority had no access to FSP (Figure 2), the respondents were requested to provide their insight into the methods followed by the concerned organ to select beneficiaries for any public intervention. Table 4 indicates that the methods that were used to determine the beneficiaries were fair and participative according to 167 (56%) non-beneficiaries and 108 (63%) beneficiaries and 190 (63.5%) non-beneficiaries and 88 (51.2%) beneficiary respondents, respectively. In both fairness and participation in the interventions, the majority of beneficiaries revealed positive insight in comparison to the non-beneficiaries. In this regard, the households who were interviewed about the fairness of the social protection committee's decision stated, "*although they cannot represent the entire members of the committee, there are a few unfair members who wanted to use their membership as a good opportunity to benefit certain households in favor of family, benefits, and relationships*".

Table 4. Respondents' insight into the methods of selecting beneficiaries (471)

Methods of selecting beneficiaries into public supports		Access to FSP		
		No (freq.)	Yes (freq.)	Total freq.
Fair	No	132	64	196
	Yes	167	108	275
	Total	299	172	471
Participative	No	109	84	193
	Yes	190	88	278
	Total	299	172	471

Access to basic public services

In the Ethiopian context, every citizen has the constitutional right to get equal access to publicly funded social services (FDRE, 1995). Besides this, addressing inequality of access to basic public services is mentioned as the fourth focus area in the NSPP. Policy context and inter-sectoral linkages are additional components that can effectively determine people's access to public institutions (DFID, 2000). As public goods providers, the labor and social affairs, agriculture, health and education sectors are linked within the conceptual sustainable livelihood framework (DFID, 2008). In this case, these sectors are local public institutions where the dedications of public management and policies are implemented. The respondents were asked dichotomous questions to estimate their access to selected basic public services. The district-wise descriptive result shown in Table 5 indicates that the majority of respondents had limited access to basic services with LSAS compared to other sectors. Selected basic public service with higher

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percentage values are supposed to be accessible services, and they can directly or indirectly affect the livelihood capacity of the households. However, the opinion of the respondents from all districts indicates that basic services such as social support to orphans, people with disabilities, and unemployed people, immediate intervention response against insecurity; and training opportunities from nearby TVET centers are found inaccessible to the majority of rural households. To indicate how access to basic public services is with access to political power, Cutter et al. (2003) debated that livelihood capacity is dependent on access to political power. This relationship suggests that limited access or lack of access to basic public services can determine households' level of livelihood capacities.

Table 5. District-wise households' access to basic public services (%)

Public sectors	Access to selected basic services	Erob	Ganta Afeshum	Gulo Mekeda	Hawuzen	Chi-square
Labor and Social Affairs Bureau (LSAS)	Have you ever received food support	68	44	47	43.5	18.6*
	Any non-food support from the government	47	35	38	39.9	3.52
	Social assistance to people with disability	47	52.4	31.6	50.4	13.69*
	Is there any social support for old-aged person	65	56	80	62	17.31*
	Is there any social support for orphans	47.8	49.5	31.6	71.3	39.3
	Any support to unemployed person	20.9	26.7	8.8	26	45.13
	Immediate response during social insecurity	39	46.7	22	52	27.37*
	Close follow-up against child-marriage	66	61	71.3	92	32*
	Are you satisfied with the services you get	44	52	46	84	28.1
Agriculture and Rural development Bureau (ARDS)	Modern inputs are available on time	55.7	46.7	88	90	34.9*
	Fairness of cost of fertilizer	44.3	45.7	56.6	85	50.43*
	Access to credit for modern inputs	56.5	48.6	69	73	18.42*
	Extension service is given on time	80	62.9	97	95	38
	Is Farmers Training Center (FTC) functional	67.8	66.7	94.9	93.9	27.98
	Are you satisfied with the services you get	54	39.6	76	61	17.93
Health Bureau (HS)	Is there free treatment of malaria	76.5	55	88	91	31.2
	Is malnutrition treatment given to children	88	73	98	94	7.64
	Is health extension given door-to-door	57	55	85	97	48.75
	Is there free training on family planning	44.5	42.9	58	92.2	24.17*
	Have you ever received healthcare exemption	49.6	52	57	54	1.64
Education Bureau (EB)	Is Adult education service nearly available	33.9	26	36	46	16.42
	The current education system is good	65	54	61	67	26.1
	Elementary school is nearly available	36	53	39	56	17.65
	Every child above 7 years old is enrolled	62	50.5	69.	93	37.72
	Have you ever received any training from TVET	38	21	13.7	46	41.49

For the sake of sustainable public interventions, local public sectors are supposed to provide integrated services to the people. The impact of access to basic public services in labor and social affairs, agriculture, education, and healthcare sectors on social vulnerability or livelihood capacity depends significantly on the extent of institutional integration among local public sectors. Hence, the target respondents were requested to evaluate the nature of horizontal integration between selected public sectors, and the result is presented in Table 6. Accordingly, above-average respondents rated high integration between labor and social affairs and agriculture, and agriculture and health sectors. Less horizontal integration is found between labor and social affairs and health sectors and the education and health sectors. As a good experience, the official reports obtained from the labor and social affairs of Ganta Afeshum and Hawuzen *Woredas* indicate that delivering free healthcare services to those who are members of health insurance and retirees of the army force and their family members are among the social responsibilities the health and labor and social affairs sectors are jointly working.

As far as the formality of institutional integration is concerned, the public servants who participated in the FGD revealed that the coordination among public institutions was more personal than institutional. The participants have justified their reason as "*If the local public bureaus could have a joint budget and plan, there are many strategic and routine activities where the employees should work together.". For instance, there are a few orphans who are receiving some financial support from our staff, but we are not able to help more than four or five orphans or any other needy children because there is no formal procedure beyond the limited social protection service delivered through the bureau of labor and social affairs*." Taking these opinions as empirical evidence, we can conclude that the extent of institutional integration among the local public sectors is not structured in the conducive way to address basic socio-economic challenges of the public.

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Table 6. Perceptions of respondents on the degree of institutional integration (N = 471)

Selected public sectors and their expected institutional form of integrations	% of respondents who believe			Chi-Square Test
	High integration	Less integration	No integration	
Labor and social affairs sector with agriculture	54.6	42.9	2.2	0.968
Labor and social affairs sector with the health	41.2	53.1	5.7	6.08
Labor and social affair with the education	42.5	48.4	9.1	3.8
Agriculture sector with the health	65	28.9	6.2	7.43
Agriculture with the Education	46.3	45.6	8.1	0.242
Education sector with the health	37	55	8.1	0.244

The descriptive result tells the perception of the respondents on whether the six objectives of social protection policy were implemented or not, presented district-wise in Table 7. There is a large variation in perception of the implementation of policy objectives among the respondents across their location. Although there is no related evidence that explains why the policy objectives are being implemented or not implemented properly, the majority of rural households located in Gulo Mekeda and Hawuzen believe that the first five objectives of the national social protection policy were implemented except for the sixth objective. However, a significant number of respondents from Erob and Ganta Afeshum districts expressed negative views or had no observations. The percentage of respondents who are uncertain about the level of implementation of the stated objectives indicates that these household heads did not have enough information about the policy.

Table 7. District-wise perception of households on the implementation of policy objectives (%)

Objectives of social protection policy of Ethiopia	Rate	Erob	Ganta Afeshum	Gulo Mekeda	Hawuzen	Total
Protect poor and vulnerable households and communities from the adverse effects of shocks and destitution	Implementing	35.5	29.1	70.9	73.9	53.9
	Not implementing	39.1	49.5	6.7	17.9	26.9
	Uncertain	24.3	21	23.4	8.1	19.2
Increasing the scope of social insurance	Implementing	38.3	28.6	33.8	59.1	39.9
	Not implementing	35.7	56.2	30.9	18.3	34.6
	Uncertain	26.1	15.2	35.3	22.6	25.5
Increase access to equitable and quality health, education and social welfare services	Implementing	44.3	31.4	67.6	80.7	57
	Not implementing	39.4	48.6	22.1	14.9	28.3
	Uncertain	25.2	20	10.3	4.4	17.7
Guarantee a minimum level of employment	Implementing	40	32.4	63.2	45.2	46.3
	Not implementing	28.7	42.9	23.5	43.5	34
	Uncertain	31.3	24.8	13.2	11.3	19.7
Enhance the social status and progressively realize the economic rights of marginalized groups	Implementing	36.5	26.7	52.9	73	48
	Not implementing	30.4	37.1	5.1	20.9	22.3
	Uncertain	33	36.2	41.9	6.1	29.7
Ensuring the different levels of society are taking appropriate responsibility for the implementation of social protection policy	Implementing	35.7	25.7	14.7	50.4	31
	Not implementing	31.3	24.8	22.8	27.8	26.5
	Uncertain	33	49.5	62.5	21.7	42.5

Components of social vulnerability

All normalized indicators and sub-components are aggregated into the Livelihood Capacity Index (LCI) within the range between zero and one to indicate the least and higher access to livelihood assets, respectively. The composite index of each component indicates that the target households are likely to have limited access to natural (0.36) and physical (0.23) capital compared to human (0.54), social (0.58), and financial (0.56) capital. The average livelihood capacity of households who had no access to FSP is found to be relatively lower than their counterparts. Taking the LCI as empirical evidence, one can conclude that the households that scored below average in livelihood capital are supposed to be weak to recover or anticipate the potential impact of social vulnerability due to their limited access to livelihood assets.

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'Exposure component' refers to the nature and degree to which households and their livelihoods are likely exposed to substantial variations on the factors shown in Figure 4. It is evident from this result that the factors scored with the highest contributing effect on households' susceptibility are exposure level due to lack of rainfall (0.97), floods (0.94), drought (0.94), crop pests (0.92), livestock disease (0.91), soil erosion (0.89), environmental pollution (0.75), and cross-border conflicts (0.65). This average result implies that whether they had access to any form of FSP or not, the majority of respondents were experiencing a high state of damage due to these substantial factors. Whereas the exposure factors related to conflicts at the household level (0.46) and community level (0.35) are found with the lowest contributing effect on social vulnerability.

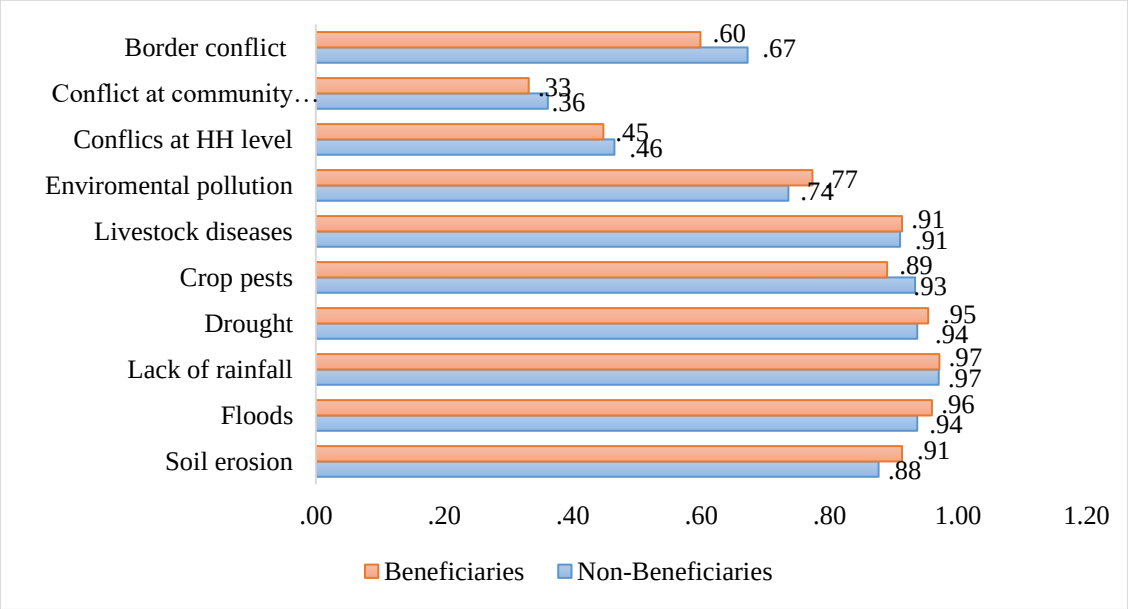

Figure 4. Weighted average of the exposure factors

As a second major component for SVI, sensitivity refers to the degree to which particular households in a target area are more susceptible to causes of social vulnerability. The result presented in Table 5 demonstrates the proportion of beneficiary and non-beneficiary households that experience the effect of sensitivity factors during the time of this survey. The proportion of household members aged less than 15 years (0.66), households who experience passive government response during the social emergency (0.56), and female discrimination at the family or community level (0.54) are among the major sensitivity factors that scored above the average

value of the threshold. The factors that scored above the average threshold are supposed to be the most important factors to determine social vulnerability. Furthermore, respondents were asked to specify any public sector from which they have ever felt discriminated against. As a result, agriculture, labor and social affairs are exceedingly mentioned sectors mostly in connection with the delivery of social protection interventions.

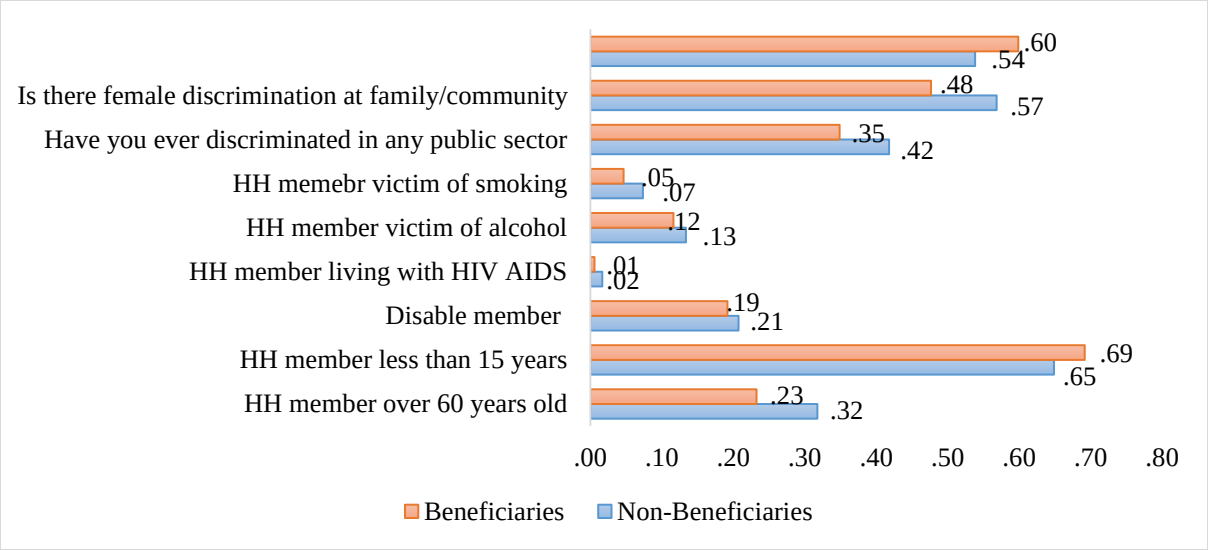

Figure 5. Weighted average of the sensitivity factors

Finally, the Livelihood Capacity Index (LCI), exposure index, and sensitivity index are statistically combined with equal weights to construct the SVI. SVI is scaled between zero and one, indicating the least and highest social vulnerability, respectively. This vulnerability triangle (Figure 6) shows that the exposure index (0.77) is found to be the highest contributing factor for social vulnerability. To compare the aggregate effect of these components on the livelihood capacity index of households, the exposure component is found with the highest potential impact. Both sensitivity and exposure contain a group of factors that require various forms of public intervention. The weighted value of each component is recombined using equation 4.2.4 to estimate SVI for beneficiaries (0.529) and non-beneficiaries (0.549). From this result, it is evident that the non-beneficiary households are found to be relatively more vulnerable than the beneficiaries.

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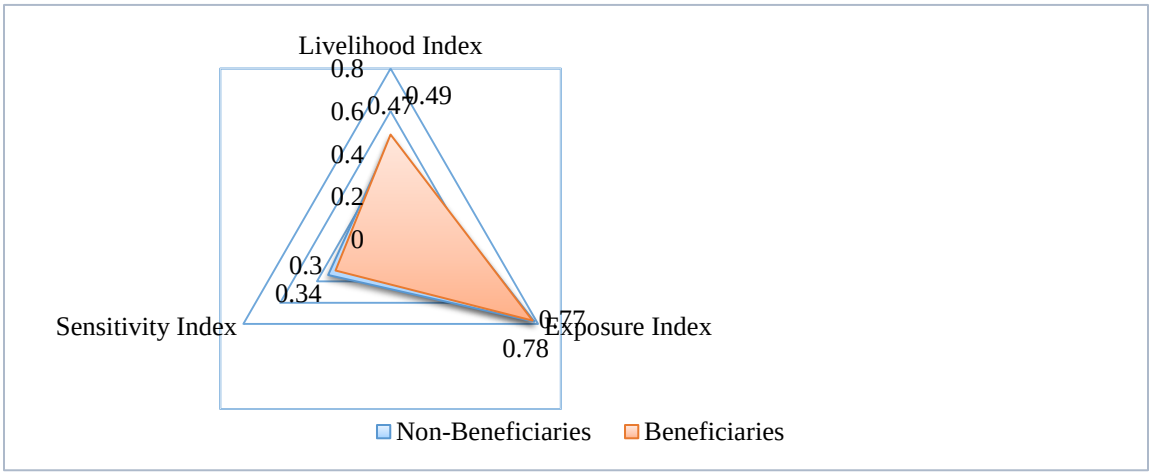

Figure 6. Weighted average value of components of SV

Propensity score matching (PSM)

As PSM is a statistical method adopted to estimate the impact of an intervention, the PSM results, such as logistic regression, propensity score, and the counterfactual impact of selected public intervention, are discussed in this section.

Predictors of propensity score

The propensity score is a generated index through binary logistic regression to indicate the conditional probability of a household to be assigned to the beneficiary group given the potential covariates (Rosenbaum and Rubin, 1983). Eleven covariates that fit the Conditional Independence Assumption (CIA) are identified as explanatory variables (Table 8) to estimate the propensity score. The coefficient indicates the contribution of each covariate to the probability of a household being assigned as a beneficiary or non-beneficiary. The negative value of coefficients suggests that as the value of covariates increases, the household has a lower probability of receiving the benefit. Households headed by females and by the older household's head, which owned a smaller number of oxen, and a smaller size of farming land, were more likely to participate in the FSP than their counterparts. Though the cause-effect relationship among these interventions is unknown, the coefficients on access to health insurance (0.634) and WICI (0.450) indicate that if the household has access to these insurances, the household has a higher probability of getting a benefit from the FSP. The constant value (2.193) is the intercept, which can be interpreted as the propensity score predicted if the coefficient value for all

covariates becomes zero. A covariate observed with a higher value of a coefficient likely increases the propensity score.

Table 8. Logistic regression results of households' FSP participation

List of Covariates	Unit of Measurement	Coef.	Robust Std. E	z	P>|z|	95% Conf.
Age of household head	Continuous	0.010	0.010	1.07		-.0091
Gender of household	(1 if Male, otherwise	-0.206	0.255	-0.81		-.7072
Household size	Continuous	-0.210	0.063	-3.31		-.335
No. of rooms	Continuous	0.019	0.136	0.14		-.248
No. of oxen	Continuous	-0.645	0.159	-4.04		-.958
Own farming land size	(1 if Male, otherwise	-0.054	0.152	-0.36		-.3533
Access to irrigation	(1 if Male, otherwise	0.020	0.332	0.06		-.632
Estimated cereal income	Continuous	-0.249	0.122	-2.03		-.4895
Credit opportunity	(1 if Male, otherwise	0.196	0.216	0.9		-.228
Access to health	(1 if Male, otherwise	0.634	0.271	2.33		.1017
Access to WICI	(1 if Male, otherwise	0.450	0.216	2.08		.0253
	cons	2.193	1.239	1.77		-.2350

Obs.: 471 LR chi2(11): 63.35 Prob > chi2: 0.0000 Pseudo R^2: 0.1025

The mean of P-score is 0.44 and 0.32 for the 171 beneficiaries and 291 non-beneficiary households, respectively (Table 9 and Figure 7). On average, both groups of respondents have scored 0.367 (36.7%) probability of participation in the FSP. To satisfy the assumption of common support or overlap, 9 observations that have been PScore outside the specified range [max ($PSmin^{control}$, $PSmin^{treatment}$) min($PSmax^{control}$, $PSmax^{treatment}$)] are discarded from the sample. Households whose estimated propensity scores were outside the range were discarded from the matching procedure (Boltana et al., 2023). Thus, by discarding eight households from the non-beneficiaries who scored below 0.093 and one household from the beneficiaries who scored above 0.766 for the convenience of matching, the sample size was reduced to 462.

Table 9. Distribution of estimated P-score for FSP

Access to FSP	Obs.	Mean	Std. Deviation	Minimum	Maximum
Non-Beneficiaries	291	0.327	0.157	0.033	0.766
Beneficiaries	171	0.441	0.159	0.093	0.779
Total	462	0.366	0.168	0.033	0.779

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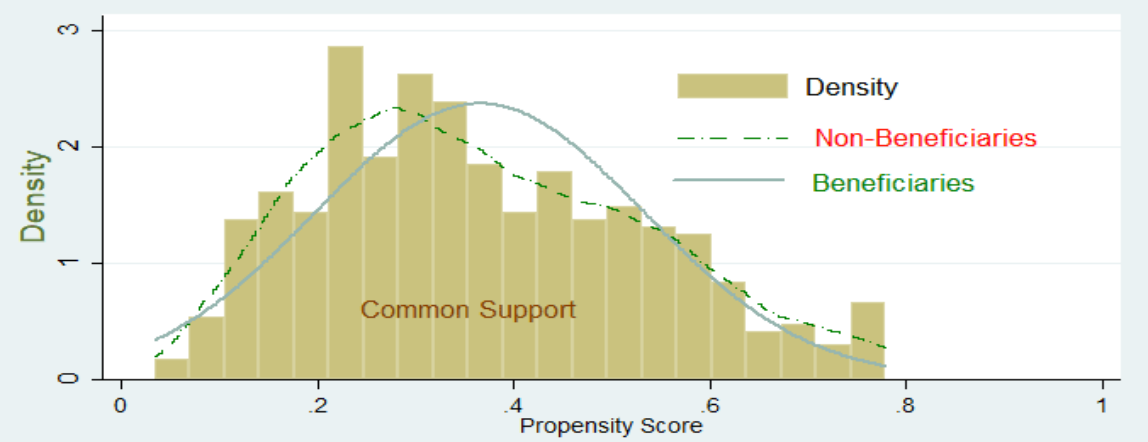

Figure 7. Distribution of propensity score

The counterfactual impact of FSP on social vulnerability

Table 10 displays the comparative level of social vulnerability between the treated and control groups of respondents. The one-way analysis of variance (ANOVA) is used to examine the difference between the aggregated mean score of SVI across the two groups. According to the result revealed in Table 10, the mean score of SVI of the treated group is found smaller than the mean score of SVI of the control group. The negative magnitude of mean difference and Pearson's correlation coefficient (r-value) indicate that the intervention is adversely related to social vulnerability.

Table 10. Average social vulnerability index of target households

	Mean SVI Value		Mean		Correlation	
Selected intervention	Treated	Control	Difference	t-value	(r value)	Sig
Food Security Program (FSP)	0.529	0.549	-0.020	2.980	-0.136**	0.03

Table 11 contains the average treatment effect (ATE) and average treatment effect of the treated (ATT) to determine the extent of counterfactual difference observed in social vulnerability between the beneficiary and non-beneficiary groups attributed to the FSP. An ATE and ATT estimated using Nearest-Neighbor Matching (NNM) (Boltana et al., 2023) suggest that the beneficiary households are likely scored lower on SVI than their counterfactual. An ATE illustrates that if the beneficiary and non-beneficiary households had access to the program, their state of social vulnerability would be observed to be 12.98% lower than their counterparts. Moreover, the negative coefficient value of ATT indicates that aggregate average access to FSP

is likely to decrease the social vulnerability status of beneficiary households nearly by 9.6%. Despite this having a slight impact, the magnitude is found consistent with the mean difference shown in Table 8.

Table 11. Average treatment effect and average treatment effect of the treated results

Number of obs. = 462			
Estimator : Nearest-neighbor matching		Matches: requested =	1
Outcome model: Matching		min =	1
Distance metric: Mahalanobis		max =	5

SVI	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.
ATE	-0.1298701	0.0479275	-2.71	0.007	-0.2238
ATT	-0.0964912	0.054804	0.078	-0.2039	-.203905

As shown in Table 12, the respondents from different locations are categorized into two categories— low and high degrees of vulnerability- taking 0.5 as the threshold score, whereby 0.093 and 0.765 SVIs represent the least and most vulnerable households, respectively. In a reasonable situation, any FSP support is supposed to reach the most vulnerable group of households. However, among 350 (67%) vulnerable households whose SVI score is above the average threshold, only 115 (33%) were involved under the FSP. Given the state of SVI as selection criteria, 235 vulnerable households who would have been assigned as beneficiaries were denied access to FSP randomly.

Table 12. Summary of SVI by *Woreda* and program participation

Category of SVI	Range	Erob (%)		Ganta Afeshum (%)		Gulo Mekeda (%)		Hawuzen (%)		Overall (%)	
		NB	B	NB	B	NB	B	NB	B	NB	B
Low	0.093 - 0.50	15.48	16.13	18.57	45.71	28.21	39.66	23.88	27.08	21.40	33.14
High	0.501 - 0.765	84.52	83.87	81.43	54.29	71.79	60.34	76.12	72.92	78.60	66.86
Total sample households		84 (100)	31 (100)	70 (100)	35 (100)	78 (100)	58 (100)	67 (100)	48 (100)	299 (100)	172 (100)
Average value of SVI		0.553	0.557	0.544	0.513	0.541	0.514	0.560	0.54	0.549	0.529
S.D. in SVI		0.063	0.078	0.053	0.0722	0.68	0.066	0.92	0.073	0.070	0.073

Note: NB = non-beneficiary households and B= beneficiary households

Conclusion

In this study, a counterfactual policy evaluation method was employed to compare the livelihood capacity and social vulnerability of rural households with access to local public institutions and social protection interventions to those with limited or no access. As stated in Ethiopia's national

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social protection policy, social protection schemes ultimately aim to reduce social vulnerability, poverty, and inequality. The findings indicate that the amplifying effects of exposure and sensitivity on social vulnerability can be mitigated through targeted public interventions. In addition to bridging food security gaps in drought-prone areas, social protection interventions play a significant role in environmental protection, which directly and indirectly strengthens the natural capital component of livelihood capacity. Given that the effectiveness of policy interventions directly affects societal well-being, stakeholders—including the government and the public—require research-based policies to inform decision-making. Policy research on rural livelihoods is therefore a critical tool for delivering evidence-based social protection interventions. When basic public goods are delivered based on rigorous scientific research, policies can be better tailored to mitigate and ultimately break the intergenerational cycle of social vulnerability and inequality. The causal effect of social protection interventions on social vulnerability, estimated using Propensity Score Matching (PSM), was found to be negative. This negative Average Treatment Effect on the Treated (ATT) suggests that, in the absence of intervention, beneficiary households would have exhibited a 9.6% higher Social Vulnerability Index (SVI). Social protection interventions enhance livelihood capacity not only through food security programs but also through the provision of essential public services such as education, health, and agricultural support. However, the 9.6% reduction is statistically insignificant when considering the combined objectives of the interventions. In conclusion, social vulnerability, inequality, and poverty can be addressed through coordinated and comprehensive public interventions. Social vulnerability remains a major multidimensional barrier to achieving sustainable rural livelihoods. The findings therefore underscore the need for integrated, proactive, productive, and evidence-based social protection interventions to alleviate social vulnerability. Finally, future research should explore the broader threats and opportunities associated with livelihood security by incorporating national and global trends, as well as institutional and market structures, which were beyond the scope of this study due to time and budget constraints. Further advanced policy-oriented research that accounts for domino and spillover effects, as well as both factual and counterfactual policy impacts, would strengthen social vulnerability analysis as a reliable evidence base for designing more effective public interventions.

Conflicts of interest

The author declares no conflicts of interest.

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References

Adimassu Z, Kessler A. 2015. Impact of the productive safety net program on farmers' investments in sustainable land management in the central rift valley of Ethiopia. Environ Dev. 16: 54-62.

Andersson, C, Mekonnen A, Stage J. 2011. Impacts of the productive safety net program in Ethiopia on livestock and tree holdings of rural households. J Dev Econ**.** 94(1), 119-126.

Androniceanu A, Georgescu I. 2022. Social protection in Europe, comparative and correlative research. Adm si Manag Public. (38): 31-45.

Ahmed M, Gassmann F. 2009. Defining vulnerability in post conflict environments. Working Paper MGSoG / 2009 / 022.

Ahmed M, Bhandari H, P.U. Gordoncillo CB, Quicoy, Carnaje GP**.** 2018. Factors affecting extent of rural livelihood diversification in selected areas of Bangladesh. SAARC J Agri. 16(1), 7-21.

Berhane G, Hoddinott J, Kumar N, Taffesse AS. 2011. The impact of Ethiopia's productive safety nets and household asset-building programme: 2006–2010. Washington, DC: IFPRI.

Bezabih M. 2017. Impacts of rural credit on households' food security and income: The Case of Kurfa Chele Woreda, East Hararghe Zone, Ethiopia. Doctoral dissertation. Haramaya University. Ethiopia.

Blomquist, J. 2003. Impact evaluation of social programs: A policy perspective. Social Safety Nets Primer Notes; No. 14. The World Bank.

Boltana, A, Tafesse A, Belay A, Recha JW, Osano PM. 2023. Impact of credit on household food security: The case of Omo microfinance institution in southern Ethiopia. J Agric Food Res. 14:100903.

Goshu D. 2013. The dynamics of poverty and vulnerability in rural Ethiopia. Ethiop. J. Econ. 22(2): 1-20.

Carney, D. 1998. Sustainable rural livelihoods: What contribution can we make? Papers presented at the Department for International Development's Natural Advisers' Conference, July 1998.

Cutter SL, Boruff BJ, Shirley WL. 2003. Social vulnerability to environmental hazards. Soc Sci Q. 84: 242-261.

CSA. 2013. Population Projections for Ethiopia. 2007-2037. Central Statistical Agency. Addis Ababa, Ethiopia.

Emuru D. 2015. Forage seed system assessment: The case of Eastern Zone of Tigray, Ethiopia. Tigray Agricultural Research Institute, Mekelle.

Devereux S, Sabates-Wheeler R, Taye MT, Sabates R, Sima F. 2014. Graduation from the food security programme in Ethiopia: FAC Ethiopia final report. Future Agricultures Consortium working paper 080. Institute of Development Studies: Brighton.

Emana, B. 2009. Cooperatives: a path to economic and social empowerment in Ethiopia. ILO. Coop AFRICA Working Paper No.9. Switzerland.

Eric Tate. 2012. Social vulnerability indices: a comparative assessment using uncertainty and sensitivity analysis. Nat Hazards. DOI 10.1007/s11069-012-0152-2.

Essama-Nssah, B. 2006. Propensity score matching and policy impact analysis-a demonstration in EViews. A Demonstration in EViews. Policy Research Working Paper; No. 3877. The World Bank.

FDRE. 1995. Constitution of the Federal Democratic Republic of Ethiopia. *Federal Negarit Gazetta*, Addis Ababa, Ethiopia.

Gebrehiwot Weldegebrial, Hyacinth Ementa Ichoku, Philip Ogbonnia Phil-Eze. 2018. Choices and implications of livelihood diversification strategies on smallholder farmer's income in Saesietsaeda Emba District, Eastern Tigray Region of Ethiopia. J Agric Ext Rural Dev. 10(8): 165-174.

Guo S, Fraser MW. 2014. Propensity score analysis: Statistical methods and applications (Vol. 11). SAGE publications.

Heckman J, Ichimura H, Todd P. 1997. Matching as an econometric evaluation estimator: Evidence from evaluating a job training programme. Rev Econ Stud. 64(4), 605-654.

Heinrich C, Alessandro M, Gonzalo V. 2010. A primer for applying propensity- Score Matching; Impact-Evaluation Guidelines: Technical Notes No. IDB-TN-161, Office of Strategic Planning and Development Effectiveness, Inter-American Development Bank. www.iadb.org

Hoddinott J, Stifel D, Hirvonen K, Minten B. 2018. The impact of large-scale social protection interventions on grain prices in poor countries: Evidence from Ethiopia. Strategy support program | working paper 116. IFPRI and EDRI.

Hoddinott J, Gilligan DO, Taffesse AS. 2009. The impact of Ethiopia's productive safety net program on schooling and child labor. Social protection for Africa's children. London: Routledge.

Hub, I. 2019. Measuring impact by design: A guide to methods for impact measurement/ Impact Canada. Privy Council Office.

Hudson P, Botzen W, Kreibich H, Bubeck P, Aerts J. 2014. Evaluating the effectiveness of flood damage mitigation measures by the application of propensity score matching. Nat Hazards Earth Syst Sci, 14:1731–1747.

ILO. 2017. World Social Protection Report 2017–19: Universal social protection to achieve the Sustainable Development Goals. International Labor Office – Geneva.

ILO. 2021. World Social Protection Report 2020-22: Social Protection at the Crossroads-in Pursuit of a Better Future. International Labor Office – Geneva.

Imran, M., Castillo, C., Diaz, F., & Vieweg, S. 2015. Processing social media messages in mass emergency: A survey. ACM Comput Surv. (CSUR). 47(4): 1-38.

Li Mingxiang. 2012. Using the propensity score method to estimate causal effects: A review and practical guide. Organ. Res. Methods. 16(2).

Merrien FX. 2013. Social protection as development policy: A new international agenda for action. Int Dev Policy 5.1: 83–100.

MoFED. (Ministry of Finance and Economic Development). 2006. Ethiopia: Building on progress. A plan for accelerated and sustained development to end poverty (PASDEP) (2005/06-2009/10) Volume I. Addis Ababa, Ethiopia.

MoLSA. (Ministry of Labour and Social Affairs). 2012. National social protection policy of Ethiopia, Addis Ababa, Ethiopia.

Moyn S. 2014. The universal declaration of human rights of 1948 in the history of cosmopolitanism. Crit Inq. 40(4): 365-384.

Nguyen CV. 2015. Development and application of a social vulnerability index at the local scale. PhD thesis. RMIT University.

Nuruzzaman, AKM. 2016. Microfinance organizations and social vulnerability to climate change Doctoral dissertation. The University of Melbourne.

Paul JG, Sebastian M, Patrick P, Laura BR, Christel MJV. 2011. Impact evaluation in practice. The International Bank for Reconstruction and Development / The World Bank.

Rubin, D. B. 1974. Estimating causal effects of treatments in randomized and nonrandomized studies. J Educ Psychol. 66(5), 688–701.

Rosenbaum PR, Rubin DB. 1983. The central role of the propensity score in observational studies for causal effects. Biometrika. 70(1): 41-55.

Sabates-Wheeler R, Devereux S. 2010. Cash transfers and high food prices: Explaining outcomes on Ethiopia's Productive Safety Net Programme. Food Policy 35(4): 274-285.

Sophie Schmitt. 2012. Comparative approaches to the study of public policymaking. Handbook of Public Policy. Routledge.

Singh SR, Eghdami MR, Singh S. 2014. The concept of social vulnerability: A review from disasters perspectives. Int J Interdiscip Multidiscip Stud**.** 1(6): 71-82.

Schreckenberg K, Camargo I, Withnall K, Corrigan C, Franks P, Roe D, Scherl LM, Richardson V. 2010. Social assessment of conservation initiatives: A review of rapid methodologies, Natural Resource Issues No. 22. IIED, London.

Sharp K, Brown T, Teshome A. 2006. Targeting Ethiopia's productive safety net programme (PSNP). Overseas Development Institute and the IDL Group.

De Sherbinin A. 2014. Climate change hotspots mapping: what have we learned?. Climatic change, 123(1): 23-37.

Haile TG, Singh SP. 2025. Understanding the root causes of livelihood vulnerability in Ethiopia's rural households: an empirical study to inform policymakers. Daagu Int J Basic Appl Res. 7(2): 792-816.

Tora TT, Degefa Tolossa, Abera Uncha. 2022. Impacts of livelihood assets on livelihood security in drought-prone Gamo lowlands of southwest Ethiopia. Geogr Sustain. 3(1), 58-67.

Yibrah HG. 2014. The economic impact of productive safety net program on poverty: evidence from central zone of Tigray National Regional State, Ethiopia. Int J Econ Behav. 4(1): 115-125.

Vedung E. 2017. Public policy and program evaluation. Routledge.

White H, Sabarwal S. 2014. Quasi-experimental design and methods, methodological briefs: Impact evaluation 8, UNICEF Office of Research, Florence.

Wondim Awoke. 2018. Impact of productive safety net program in rural community of Ethiopia: A review study. J Agric Ext Rural Dev. 10(5): 84-88.

Welteji D, Mohammed K, Hussein K. 2017. The contribution of productive safety net program for food security of the rural households in the case of Bale Zone, Southeast Ethiopia. Agric. Food Secur. 6(1): 53.

Williams JO. 1978. Policy analysis: What governments do, why they do it, and what difference it makes. Am Pol Sci Rev. 72(2): 635-636.