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# Understanding social protection in vulnerable regions: evidence from Ethiopia's PSNP

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## ABSTRACT

This paper evaluates the medium-run impacts of Ethiopia's Productive Safety Net Program (PSNP) in the Southern Nations, Nationalities and Peoples' Region (SNNPR), an ecologically fragile and understudied area. Using a household panel from 2016 and 2021, we estimate program effects with Difference-in-Differences (DID) and doubly-robust DID (DRDID) to address nonrandom program placement. PSNP significantly improves dietary diversity – by about 16–17% relative to baseline – and raises livestock ownership by roughly 20% points. Seasonal food shortages, however, remain unchanged, partly due to recurrent delays in transfer disbursement. DRDID reveals moderate herd expansion that conventional DID understates, indicating that selection and drought dynamics influence asset outcomes. Semi-structured interviews with local officials and development agents help explain these mechanisms, underscoring how administrative capacity and climate shocks shape household responses. Results highlight the need for timely transfers and stronger complementary services to enhance food security and productive assets in vulnerable regions.

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O15; O22

## 1. Introduction

Social protection programs play a central role in stabilizing consumption, reducing vulnerability, and enabling longer-term poverty reduction. Evidence from Latin America, South Asia, and Sub-Saharan Africa shows that predictable transfers and employment-based public works can improve food security, strengthen human capital, and support investment in small productive assets. Conditional cash transfers such as Brazil's Bolsa Família and Mexico's Prospera tie benefits to schooling and health checks and yield persistent gains in nutrition and human capital (De Brauw et al. 2014; Parker and Todd 2017). In Africa and South Asia, programs like Ghana's LEAP and Bangladesh's CFPR-TUP demonstrate how regular support – sometimes combined with asset transfers or training – can smooth consumption and help households rebuild livestock and occupational capacity (Ahmed et al. 2009; Bandiera et al. 2017). Public works programs, including India's MGNREGA and Kenya's HSNP, also illustrate the

stabilizing effect of predictable employment or shock-responsive transfers in drought-prone regions (Dutta et al. 2014; Merttens et al. 2013).

China's recent record of poverty reduction provides another large-scale example of how growth, structural transformation, and targeted interventions can work together to reduce deprivation. Macro- and micro-level studies document steep declines in rural poverty, driven by agricultural reforms, nonfarm employment expansion, and regionally differentiated development. Evaluations of China's minimum income guarantee program (Dibao) further show that although transfers can stabilize consumption, their effectiveness depends critically on eligibility rules, implementation capacity, and local political economy conditions. China's more recent Targeted Poverty Alleviation (TPA) campaign also emphasized accurate identification and coordinated delivery. Together, these experiences reinforce a broader lesson for PSNP: well-designed anti-poverty programs generate sustained welfare gains only when supported by strong administrative systems and reliable implementation.

Ethiopia's Productive Safety Net Program (PSNP) fits within this global landscape. A substantial body of research finds that PSNP improves food consumption, reduces distress sales of livestock, and supports household resilience during shocks (Devereux 2006; Gilligan, Hoddinott, and Taffesse 2008). More recent studies document gains in calorie intake and dietary diversity, although evidence on longer-term asset accumulation remains mixed. Targeting errors, political interference, and weak livelihood linkages also contribute to heterogeneous outcomes across regions and phases (Berhane et al. 2014; Sharp, Brown, and Teshome 2006; Welteji, Ali, and Ponnusamy 2017).

Despite a large evidence base, SNNPR remains understudied, even though it is among Ethiopia's most densely populated, food-insecure, and ecologically fragile regions. Most rigorous evaluations focus on northern or central areas, leaving limited causal evidence on PSNP's performance in SNNPR during Phase IV (2016–2021), a period marked by renewed livelihood emphasis and multiple drought shocks. This gap is notable because SNNPR combines several features that complicate both program delivery and causal identification: high climate variability, pronounced administrative capacity constraints at the local level, and substantial variation in transfer timing across woredas. These characteristics make it an important setting for testing whether PSNP's strengths generalize to areas facing persistent implementation challenges.

This study provides one of the first causal assessments of PSNP Phase IV in SNNPR using a two-wave government-collected household panel covering 1788 rural households surveyed in 2016 and 2021. Because program placement and eligibility are not random, the analysis applies Difference-in-Differences (DID) and doubly-robust DID (DRDID). DID offers transparency and comparability with earlier PSNP work, while DRDID addresses baseline imbalance and potential misspecification – issues that are salient where targeting combines formal criteria with local discretion.

We find that PSNP substantially improves dietary diversity by about 16–17% relative to baseline and increases the probability of livestock ownership by roughly 20% points in SNNPR. These are meaningful welfare gains for households starting from high vulnerability levels. Seasonal food shortages, however, remain unchanged, largely because repeated delays in transfer disbursement prevent the program from stabilizing consumption during lean periods. Evidence of moderate herd expansion emerges once baseline

differences are addressed through DRDID, suggesting that conventional DID methods may understate PSNP's contribution to asset rebuilding in climate-stressed settings. PSNP is effective at improving the quality of consumption and supporting reentry into livestock ownership, but administrative frictions limit its ability to reduce seasonal hunger or support larger herd accumulation.

The paper makes two main contributions. First, it provides rigorous causal evidence from a region and program phase that have received little empirical scrutiny. SNNPR differs from other regions in administrative capacity, market access, and ecological stress, yet remains central to Ethiopia's food-security landscape. The use of a clean two-wave panel and doubly robust methods offers more credible evidence on PSNP's medium-run impacts in a context where targeting is nonrandom and exposure to drought varies sharply across locations. By examining Phase IV specifically, the analysis also provides new evidence on a program phase that placed greater emphasis on livelihoods and resilience, yet remains poorly documented in the literature.

Second, it integrates quantitative analysis with qualitative insights to clarify mechanisms. Semi-structured interviews with woreda officials, development agents, and community representatives illuminate why dietary quality improves while seasonal hunger persists, and why livestock ownership rises even as larger herd expansion remains limited. These insights also show how transfer timing, administrative bottlenecks, and drought disruptions shape household responses. The mixed-methods approach also illustrates a broader methodological contribution: in settings where detailed multi-round panel data are scarce and administrative shocks are difficult to measure, qualitative insights can meaningfully complement quasi-experimental analysis by revealing the timing, institutional frictions, and behavioral pathways through which program effects unfold. This strategy is especially relevant for evaluating social protection systems in developing countries, where program functioning often varies more than program design.

## **2. Program context and data**

### **2.1. PSNP in SNNPR**

The Productive Safety Net Program (PSNP), launched in 2005, represents Ethiopia's shift from short-term emergency relief toward a predictable, development-oriented safety net aimed at reducing chronic food insecurity. Its core objectives are to stabilize consumption, prevent asset depletion, and build household and community resilience through cash or food transfers and public works. Over time, the program has evolved across five phases (2005–2021), expanding from roughly 7 million beneficiaries to almost 8 million nationwide, broadening its geographic coverage from four highland regions to nearly all regions except Gambella and Benishangul Gumuz. Early phases (I – II) focused on establishing national safety-net systems and meeting immediate food needs, whereas Phase III introduced stronger livelihood and resilience components. Phase IV (2015–2020) saw the highest scale and budget, though graduation outcomes declined sharply, revealing persistent implementation challenges. Graduation defined as a household's ability to meet year-round food needs and withstand minor shocks remains limited

due to recurrent climatic shocks, weak livelihood linkages, and insufficient complementary services.

China's recent record of poverty reduction provides another large-scale example of how growth, structural transformation, and targeted interventions can work together to reduce deprivation. Macro- and micro-level studies document steep declines in rural poverty, driven by agricultural reforms, nonfarm employment expansion, and regionally differentiated development. Evaluations of China's minimum income guarantee program (Dibao) further show that although transfers can stabilize consumption, their effectiveness depends critically on eligibility rules, implementation capacity, and local political economy conditions. China's more recent Targeted Poverty Alleviation (TPA) campaign also emphasized accurate identification and coordinated delivery. Together, these experiences reinforce a broader lesson for PSNP: well-designed anti-poverty programs generate sustained welfare gains only when supported by strong administrative systems and reliable implementation.

PSNP implementation relies on two major components: public works, which engage labor-capable households in community asset creation such as soil and water conservation, roads, and irrigation; and direct support, which provides unconditional transfers to labor-poor households (elderly, disabled, or chronically ill). A complementary set of systems disaster risk management, management information systems, targeting registries, and livelihood services aims to strengthen resilience and foster sustainable asset accumulation.

The Southern Nations, Nationalities, and Peoples' Region (SNNPR) is a critical study area due to its unique socio-economic and environmental characteristics. Home to over 56 ethnic groups, the region is diverse yet highly vulnerable to cyclical food shortages, chronic poverty, and environmental degradation. Agriculture is the dominant livelihood but suffers from land fragmentation, low productivity, and recurrent droughts. Food insecurity in SNNPR is seasonal and severe during the pre-harvest lean months when prices rise and household food stocks decline. Environmental problems soil erosion, deforestation, and declining soil fertility compound vulnerability and impede sustainable agricultural growth. These characteristics make SNNPR not only representative of Ethiopia's broader food-security challenges but also a region where PSNP outcomes provide important insights into program effectiveness.

Within SNNPR, the PSNP has contributed to improvements in food consumption, asset accumulation, and environmental rehabilitation through public works. Still, outcomes are uneven, and graduation remains extremely low. Between 2020 and 2021, only 17,814 households graduated despite more than one million annual beneficiaries and high budget allocations, indicating that the program often provides short-term support without enabling long-term self-reliance. Implementation delays especially late transfers during lean seasons and labor-intensive public works that strain vulnerable households reduce the program's effectiveness. Persistent shocks and limited access to complementary livelihood services further inhibit sustainable progress.

Several features of PSNP's design are central to the empirical strategy. First, program placement and household eligibility are not random. Targeting occurs through a combination of community wealth ranking and administrative verification. Households are assessed based on visible indicators of vulnerability – quality of dwelling, land size, livestock ownership, and chronic food insecurity – and assigned either to labor-

based public works or direct support. This process creates strong scope for selection on observables and unobservables, motivating the use of doubly-robust DID estimators.

Second, implementation varies substantially across woredas (counties). In SNNPR, constraints such as limited administrative capacity, uneven monitoring of public works, and delays in payment disbursement are common, especially during drought years. These features influence both program effectiveness and household behavior, and they help explain why some outcomes – such as dietary diversity – may respond faster to transfers than others – such as food-gap months or livestock accumulation.

Third, the study period covers PSNP Phase IV (2016–2021), a phase characterized by renewed emphasis on resilience and livelihoods, but also by multiple drought shocks in SNNPR. Because the baseline survey was conducted at the start of Phase IV and the endline at its conclusion, the two-round panel captures substantial program exposure and a meaningful window for medium-run impacts. This timing is well-suited for Difference-in-Differences (DID) and doubly-robust DID approaches that rely on comparing pre- and post-program changes between beneficiaries and similar non-beneficiaries.

These features create a setting in which PSNP is likely to affect both consumption smoothing (through transfers) and asset dynamics (through reduced distress sales and gradual accumulation), but in a context where selection processes and implementation heterogeneity pose methodological challenges. The next subsection describes the survey design used to address these issues.

## **2.2. Data and sampling**

The analysis uses an original household survey collected by the SNNPR regional government for program monitoring. The dataset covers 1788 rural households—851 beneficiaries and 937 non-beneficiaries – interviewed in 2016 and 2021. These two rounds provide a balanced baseline – endline panel spanning the full duration of PSNP Phase IV.

The sampling frame was designed to capture regional economic and ecological diversity. One district was selected from each of SNNPR's 11 administrative zones. Within each district, kebeles (villages) were chosen based on rural population density and prevalence of chronic food insecurity – criteria that closely align with PSNP placement. Households were randomly sampled from administrative lists, stratified by beneficiary status. This design ensures that treated and comparison households are drawn from similar agro-ecological and market environments. While program eligibility is not random, the presence of comparable untreated households in the same districts improves the credibility of constructing counterfactuals.

The baseline survey (2016) was fielded shortly after the launch of PSNP Phase IV, before substantial program activities such as public works or livelihood support were fully implemented. The endline survey (2021) was collected at the end of the five-year phase, after households had received several cycles of transfers and experienced multiple drought shocks. This interval is long enough to detect medium-run effects on consumption and asset dynamics. The dataset represents one of the few government-implemented panel surveys covering PSNP households in SNNPR. The combination of rich covariates, large sample size, and panel structure supports robust causal inference methods.

### 2.3. Outcome variables and covariates

We examine four primary outcomes reflecting PSNP's dual goals of stabilizing consumption and protecting productive assets.

- (1) *Household Dietary Diversity (FSDD)*. Measured as the number of distinct food groups consumed in the previous 24 hours. This indicator captures diet quality and is expected to respond quickly to predictable transfers.
- (2) *Food-Gap Months*. A count of months within the past year in which the household could not meet its food needs. This measure reflects seasonal food insecurity and depends on both transfers and the timing of disbursements.
- (3) *Livestock Ownership (Extensive Margin)*. A binary indicator equal to 1 if the household owns any livestock. This captures PSNP's ability to prevent distress sales and facilitate initial asset accumulation.
- (4) *Livestock Quantity (Intensive Margin)*. Total livestock holdings converted into Tropical Livestock Units (TLU), expressed in logarithms. This reflects the scale of productive assets.

The dataset includes extensive pre-treatment covariates used for both descriptive analysis and for propensity-score weighting. Consistent with PSNP targeting, beneficiary households are poorer and more food-insecure at baseline. They have lower dietary diversity, higher food-gap months, weaker dwelling conditions, and smaller landholdings (Table 1). These differences underscore the need for DID and DRDID methods to estimate causal impacts.

## 3. Empirical strategy

Our empirical strategy combines a benchmark estimator – a standard Difference-in-Differences (DID) – with a more robust estimator, the doubly-robust DID (DRDID) of Sant'anna and Zhao (2020). DID provides a familiar comparison and facilitates interpretation relative to prior PSNP evaluations, while DRDID adjusts for observable imbalance and potential model misspecification.

Beneficiaries often live in areas with weaker administrative capacity or more severe drought exposure, and comparison households may differ in ways that affect outcomes even absent the program. DID provides a clean starting point but may be vulnerable to residual imbalance, whereas DRDID offers additional protection in settings where targeting combines formal guidelines with local discretion. The two estimators therefore serve complementary roles.

### 3.1. Baseline selection patterns

To characterize how households are selected into PSNP and to construct propensity scores for the DRDID estimator, we begin with a logit model:

$$Pr(T_i = 1 | X_i) = \Lambda(X_i' \theta),$$

**Table 1.** Summary statistics by treatment group at the baseline.

|                                  | Treatment Group |          | Control Group |          | p-value of difference |
|----------------------------------|-----------------|----------|---------------|----------|-----------------------|
|                                  | Mean            | Std. dev | Mean          | Std. dev |                       |
| <b>Household Characteristics</b> |                 |          |               |          |                       |
| Dietary Diversity                | 3.041           | 1.636    | 3.849         | 1.295    | 0                     |
| Food Gap                         | 2.69            | 2.292    | 2.409         | 2.451    | 0.013                 |
| livestock Quantity               | 2.023           | 2.927    | 2.222         | 2.79     | 0.143                 |
| dwelling very poor               | 0.137           | 0.344    | 0.105         | 0.306    | 0.036                 |
| dwelling bad shape               | 0.253           | 0.435    | 0.166         | 0.372    | 0                     |
| dwelling moderate                | 0.348           | 0.477    | 0.326         | 0.469    | 0.324                 |
| dwelling good                    | 0.174           | 0.379    | 0.234         | 0.424    | 0.002                 |
| dwelling very good               | 0.088           | 0.284    | 0.17          | 0.376    | 0                     |
| contact with agent               | 0.224           | 0.417    | 0.145         | 0.353    | 0                     |
| food expenditure                 | 844.739         | 537.533  | 925.744       | 873.891  | 0.02                  |
| non-food expenditure             | 297.77          | 346.033  | 324.365       | 330.525  | 0.098                 |
| off-farm income source           | 0.605           | 0.489    | 0.69          | 0.463    | 0                     |
| taken out loans                  | 0.215           | 0.411    | 0.198         | 0.398    | 0.38                  |
| land size                        | 3.021           | 0.634    | 5.289         | 2.1      | 0                     |
| fertiliser use                   | 51.62           | 51.219   | 80.145        | 61.848   | 0                     |
| improved seed use                | 0.194           | 0.396    | 0.15          | 0.357    | 0.012                 |
| <b>Head Characteristics</b>      |                 |          |               |          |                       |
| age                              | 41.657          | 9.598    | 40.454        | 9.417    | 0.008                 |
| female                           | 0.348           | 0.477    | 0.245         | 0.43     | 0                     |
| married                          | 0.793           | 0.406    | 0.86          | 0.347    | 0                     |
| single                           | 0.027           | 0.163    | 0.022         | 0.148    | 0.501                 |
| divorced                         | 0               | 0        | 0             | 0        |                       |
| widowed                          | 0.18            | 0.384    | 0.118         | 0.322    | 0                     |
| no education                     | 0.596           | 0.491    | 0.522         | 0.5      | 0.002                 |
| primary education                | 0.347           | 0.476    | 0.393         | 0.489    | 0.044                 |
| secondary education              | 0.057           | 0.232    | 0.084         | 0.278    | 0.026                 |
| employed                         | 0.072           | 0.258    | 0.091         | 0.287    | 0.138                 |
| self-employed                    | 0.559           | 0.497    | 0.629         | 0.483    | 0.003                 |
| unpaid job                       | 0.369           | 0.483    | 0.28          | 0.449    | 0                     |

where  $T_i$  indicates beneficiary status and  $X_i$  includes pre-treatment characteristics. Covariates reflect PSNP targeting criteria and include: demographic characteristics (age, sex of the head, household size); indicators of economic status (land size, dwelling condition, food and non-food expenditures); productive capacity (livestock ownership, improved seed use); income diversification (off-farm income); institutional contact (extension agent visits); and drought exposure.

These variables capture both structural vulnerability and the institutional interfaces that play a role in program identification. The logit estimates (Table 2) illustrate systematic baseline differences between treated and untreated households, underscoring the need to adjust for selection in the impact evaluation.

The qualitative interviews reinforce these patterns. Officials noted that households with regular contact with extension agents or greater community visibility are more likely to be enrolled, while remote or socially isolated households may be missed despite being equally or more vulnerable. Such features are difficult to capture fully with survey data alone, making propensity-score weighting valuable but not sufficient. This motivates complementing the weighting with regression adjustment, as implemented by the DRDID estimator.

**Table 2.** Determinants of PSNP receipt.

| VARIABLES               | (1)<br>Treatment      |
|-------------------------|-----------------------|
| age                     | 0.00999*<br>(0.00574) |
| sex                     | 0.241<br>(0.149)      |
| single                  | 0.123<br>(0.322)      |
| widowed                 | 0.162<br>(0.175)      |
| Primary education       | 0.00618<br>(0.119)    |
| Secondary education     | -0.0417<br>(0.212)    |
| Dwelling type bad shape | 0.178<br>(0.178)      |
| Dwelling type moderate  | -0.149<br>(0.164)     |
| Dwelling type good      | -0.550***<br>(0.181)  |
| Dwelling type very good | -0.874***<br>(0.206)  |
| Contact with agent      | 0.660***<br>(0.129)   |
| Ln food expenditure     | -0.136<br>(0.123)     |
| Ln non-food expenditure | -0.156<br>(0.103)     |
| Off-farm income source  | -0.411***<br>(0.106)  |
| Self-employed           | 0.0889<br>(0.185)     |
| Un-paid work            | 0.296<br>(0.200)      |
| Take out loans          | 0.000174<br>(0.126)   |
| Improved seed use       | 0.392***<br>(0.131)   |
| Constant                | 1.317<br>(0.927)      |
| Observations            | 1,775                 |

Robust standard errors in parentheses.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

### 3.2. Difference-in-differences estimator

Our starting point is a conventional DID specification:

$$Y_{it} = \alpha_i + \gamma_t + \beta(T_i \times Post_t) + X'_{it}\delta + \varepsilon_{it},$$

where  $Y_{it}$  is dietary diversity, food-gap months, livestock ownership, or log TLU;  $T_i$  indicates PSNP beneficiary status;  $Post_t$  is an indicator for the 2021 endline;  $\alpha_i$  and  $\gamma_t$  are household and time fixed effects;  $X_{it}$  captures time-varying socioeconomic conditions.

With only two survey waves, DID identifies the ATT under the assumption that in the absence of the program, treated and untreated households would have experienced similar changes over time. Although this assumption cannot be directly tested, the sampling design – drawing treated and comparison households from the same districts –

and the similarity in the dispersion of pre-treatment outcomes support its plausibility. DID also aligns with earlier PSNP literature, facilitating comparison of medium-run impacts.

Contextual factors further support the plausibility of parallel trends. Households across sampled kebeles face similar agricultural cycles, market integration, and rainfall patterns, and PSNP status is stable over time, reducing concerns about endogenous switching. Qualitative interviews also indicate that selection is based on long-term vulnerability rather than recent welfare changes, which limits the risk that households were chosen in response to short-run shocks.

However, given the substantial baseline imbalance in [Table 1](#), DID may be biased if treated households would have trended differently even without the program – for example, because of differential administrative support, exposure to drought shocks, or persistent structural disadvantages. This motivates the use of a more robust estimator.

### **3.3. Doubly robust Difference-in-differences (DRDID)**

The preferred estimates come from the DRDID estimator of Sant’anna and Zhao (2020). DRDID combines two components: (1) Inverse-probability weighting using the propensity scores from the logit model and (2) Outcome regression adjustment for untreated potential outcomes.

Intuitively, DRDID compares the observed change among beneficiaries with a weighted and regression-adjusted change among non-beneficiaries whose observable characteristics resemble those of treated households. The estimator is consistent if either the propensity-score model or the regression model is correctly specified – providing ‘double robustness.’

This property is particularly useful in SNNPR for three reasons. First, targeting combines observable criteria (such as dwelling condition and landholding) with local discretion, increasing the risk of residual imbalance in DID. Second, the region experienced multiple drought events and administrative irregularities during Phase IV; regression adjustment helps capture nonlinear outcome evolution associated with these shocks. Third, the richness of the baseline covariates, combined with stable beneficiary status over time, makes it plausible that at least one component of DRDID is correctly specified.

Propensity-score diagnostics confirm substantial overlap in the covariate distributions of treated and comparison households, and weighting improves balance across all key characteristics. For these reasons, DRDID is our preferred estimator, and DID serves as a benchmark for comparison.

An additional advantage of DRDID in this setting is that it mitigates the influence of local implementation shocks that may interact with beneficiary status. For example, delayed transfers, inconsistent public-works supervision, and drought-related disruptions often affect treated and comparison households differently within a woreda. These shocks create nonlinearities that a fixed-effects DID may not absorb. DRDID’s regression-adjusted component helps capture such heterogeneity more effectively than weighting or fixed effects alone.

For DRDID, identification requires adequate overlap and reasonable specification of either the propensity-score model or outcome regression. Given PSNP’s transparent targeting criteria and the extensive set of baseline covariates, these conditions are

plausible. The stable assignment of treatment status over time further supports validity, as does the strong overlap observed in the propensity-score distribution.

Potential threats to identification primarily relate to local climatic shocks and administrative frictions. While both treated and comparison households face similar drought cycles at the zone level, more severe micro-regional variation could in principle bias results if unobserved factors correlate with PSNP participation. Measurement error in food-gap months – an inherently coarse indicator – may attenuate estimated effects toward zero but does not threaten identification. Overall, the combination of clean panel data, extensive baseline covariates, stable assignment, and qualitative evidence supporting selection on long-run vulnerability provides a strong basis for the empirical strategy.

## 4. Main results

### 4.1. Determinants of participation

Table 2 reports logit estimates of the probability of receiving PSNP support. The results confirm that targeting in SNNPR prioritizes structurally vulnerable households, consistent with program guidelines but also indicative of potential baseline imbalance. Older-headed households and those living in poorer dwellings are more likely to participate, reflecting the emphasis on chronic vulnerability. Households with more diversified income sources – particularly those engaged in off-farm activities – are significantly less likely to be selected, suggesting that local committees perceive diversification as a signal of relative security. Contact with extension agents strongly predicts participation, indicating that institutional visibility plays an important role in program identification.

Overall, the baseline differences reinforce the need for estimators that adjust for selection. They also help interpret later findings: because program participants begin from a more constrained position, improvements in dietary diversity or livestock ownership represent meaningful shifts toward greater resilience.

### 4.2. Impacts on food security and asset accumulation

Figure 1 plots the raw distributional change of the key dependent variables. Regression analyses below will provide more rigorous estimation of treatment effects.

#### 4.2.1. Dietary diversity

We first examine the impact of PSNP on dietary diversity, measured as the number of food groups consumed in the previous 24 hours. The DID estimates (Table 3) indicate a substantial improvement: treated households experience an increase of approximately 0.63–0.64 food groups, a gain of about 17% relative to the baseline mean. The effect is virtually identical with and without controls, suggesting that it is not driven by differential movements in observable characteristics.

The DRDID estimator yields a similar and precisely estimated effect, 0.58 food groups, roughly 16% of the mean (Table 4). The similarity across estimators increases confidence in the result. The magnitude is consistent with the program's design: predictable transfers relax short-term budget constraints, allowing households to diversify away from staple-heavy diets. The improvement is also consistent with qualitative evidence on household

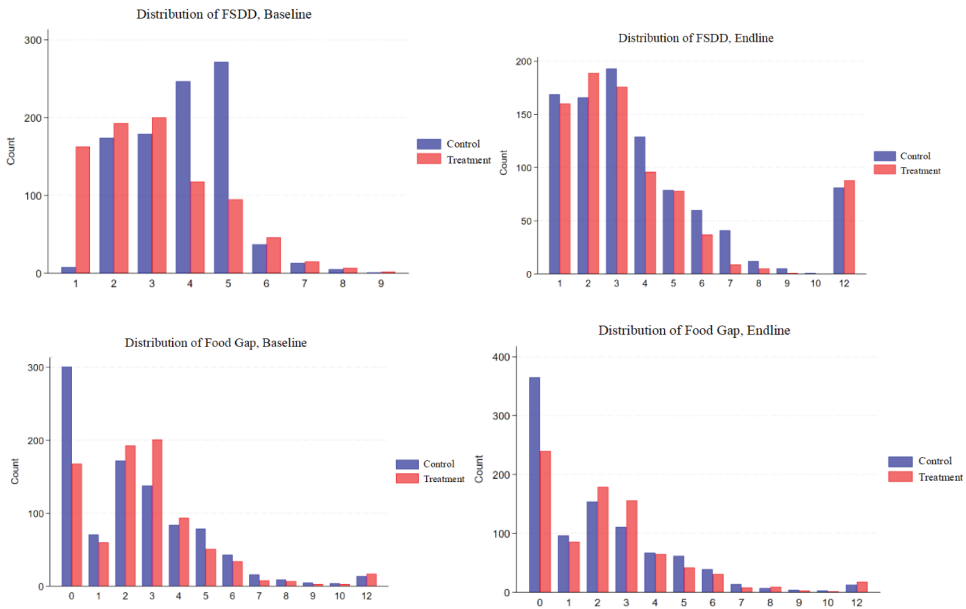


Figure 1. Distributional change of key outcome variables before and after treatment.

Table 3. DID results.

|              | (1)                 | (2)                  | (3)                  | (4)                   | (5)                 | (6)                  | (7)                  | (8)                   |
|--------------|---------------------|----------------------|----------------------|-----------------------|---------------------|----------------------|----------------------|-----------------------|
| VARIABLES    | FSDD                | FoodGap              | Livestock ownership  | Ln livestock quantity | FSDD                | FoodGap              | Livestock ownership  | Ln livestock quantity |
| Treat*Post   | 0.640***<br>(0.118) | -0.00369<br>(0.0604) | 0.197***<br>(0.0139) | 0.0124<br>(0.0348)    | 0.634***<br>(0.115) | -0.00554<br>(0.0640) | 0.196***<br>(0.0139) | 0.0267<br>(0.0345)    |
| Control      | no                  | no                   | no                   | no                    | yes                 | yes                  | yes                  | yes                   |
| Observations | 3,550               | 3,550                | 3,550                | 2,989                 | 3,550               | 3,550                | 3,550                | 2,989                 |
| R-squared    | 0.428               | 0.265                | 0.303                | 0.288                 | 0.448               | 0.308                | 0.322                | 0.312                 |
| Mean of Y    | 3.703               | 2.365                | 0.842                | 0.442                 | 3.703               | 2.365                | 0.842                | 0.442                 |

Robust standard errors in parentheses. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

Table 4. DrDID results.

| VARIABLES        | (1)                 | (2)                | (3)                  | (4)                   |
|------------------|---------------------|--------------------|----------------------|-----------------------|
|                  | FSDD                | FoodGap            | Livestock ownership  | Ln livestock quantity |
| Treatment Effect | 0.584***<br>(0.138) | 0.0578<br>(0.0692) | 0.197***<br>(0.0146) | 0.305***<br>(0.0206)  |
| Observations     | 3,550               | 3,550              | 3,550                | 2,824                 |
| Mean of Y        | 3.703               | 2.365              | 0.842                |                       |

Robust standard errors in parentheses. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.1$ .

use of transfers for immediate consumption needs. The size of the effect, relative to the low baseline diet quality, indicates that households quickly adjust food choices when liquidity constraints are relaxed.

These dietary gains also match documented patterns from other large-scale safety-net programs. In settings where food prices are volatile and households hold few buffer assets, the marginal value of cash transfers for diet diversification is high. Respondents

noted that modest but predictable transfers allow households to ‘add one or two better foods back into the meal,’ often by shifting expenditures from staple cereals to legumes, vegetables, or small animal products. Such adjustments can occur rapidly, which helps explain the strong medium-run effect despite substantial implementation challenges elsewhere in the program.

#### **4.2.2. Food-Gap Months**

In contrast, PSNP has no detectable effect on the number of months during which households face food shortages. DID estimates are near zero and statistically insignificant, and DRDID confirms this null effect. Given an average of about 2.4 food-gap months at baseline, the point estimates suggest that PSNP reduces shortages by at most a few days per year – a change too small to be meaningful.

This divergence between dietary diversity and food-gap months is informative. While dietary improvements reflect short-term consumption smoothing, food-gap months capture seasonal hunger and timing of access. Qualitative interviews provide possible explanations for the null result: payment delays, particularly during drought years, often shift transfers away from the lean season when they are most needed. Thus, even though households consume a more varied diet overall, the timing of transfers may be insufficient to eliminate seasonal shortages.

Several additional mechanisms help explain the absence of detectable reductions in food-gap months. First, this measure is inherently coarse: households report shortages in whole-month units, which introduces substantial rounding and recall error that may attenuate estimates. Second, lean-season conditions are strongly shaped by local grain prices, which spiked repeatedly during Phase IV; transfers may improve diet quality without being large enough to prevent seasonal gaps once prices surge. Third, repeated droughts reduce agricultural output and increase dependence on purchases precisely when transfers are least reliable, amplifying the timing mismatch. Finally, qualitative respondents emphasized that even small delays – ‘arriving two months late,’ as one official put it – can shift the relief window away from the hungry season entirely, undermining the program’s ability to narrow food gaps.

#### **4.2.3. Livestock assets**

PSNP generates meaningful improvements in livestock holdings, though effects differ across margins. On the extensive margin, both DID and DRDID estimates indicate that the program increases the probability of owning any livestock by about 20% points, a sizable gain given an 84% baseline ownership rate. This consistent result across estimators suggests that predictable transfers help households avoid distress sales during shocks and allow them to acquire small animals, an interpretation echoed by local development agents who noted that beneficiaries often ‘recover at least one small animal after a bad year.’

Effects estimates on the intensive margin deviates. The DID estimates show little change in total livestock holdings, implying limited growth in herd size. However, the DRDID estimator reveals a 30% increase in TLU, an economically meaningful shift equivalent to several goats or part of a cow at the sample mean. This discrepancy suggests that untreated households – who tend to be somewhat better off – may have rebuilt assets more rapidly in the absence of the program,

causing DID to understate gains among beneficiaries. The DRDID findings align with qualitative accounts describing the gradual rebuilding of small-stock herds when transfers stabilize consumption. The results point to modest but genuine asset protection effects, with clear gains in entry into ownership and evidence of moderate herd expansion once selection is appropriately accounted for.

The pattern of strong extensive-margin effects but modest intensive-margin gains mirrors findings from other contexts where households face binding liquidity and climate constraints. Small-stock animals such as goats and sheep require low initial investment. They can be replenished relatively quickly once consumption is stabilized. In contrast, larger herd expansion depends on food availability, veterinary access, and reduced exposure to drought – all factors repeatedly highlighted in interviews as severe constraints in SNNPR. Households frequently described using transfers to ‘replace the one goat sold last year’ rather than to initiate substantial accumulation. This points to PSNP functioning primarily as an asset-protection program rather than a transformative asset-building intervention.

The heterogeneity implied by the DID-DRDID divergence also suggests differential capacity to recover after shocks. Comparison households typically have better land, access to cash income, or stronger ties to local institutions, enabling faster post-drought recovery. In contrast, PSNP households begin from a much lower asset base and rely on transfers to smooth consumption before considering expansion. DRDID’s correction for baseline imbalance therefore captures a recovery trajectory among beneficiaries that standard DID cannot detect, underscoring the value of flexible estimators in contexts where vulnerability and shock exposure vary sharply across households.

To sum up, the combination of DID and DRDID results yields a coherent picture of PSNP’s medium-run effects in SNNPR:

- *Consumption smoothing is effective but uneven.* Dietary diversity improves substantially, indicating that households use transfers to enhance diet quality. However, seasonal shortages persist, likely due to timing issues in transfer disbursement and repeated drought shocks.
- *Asset protection is substantial, especially at the extensive margin.* The program substantially increases the share of households that own livestock, and DRDID detects moderate gains in herd size that traditional DID misses. This pattern reflects both reduced distress sales and gradual rebuilding of small-stock assets.
- *Methodological choice matters.* The similarity between DID and DRDID for dietary diversity and livestock ownership suggests robust impacts. The divergence for livestock quantity highlights the importance of adjusting for baseline differences in settings like PSNP, where targeting and vulnerability vary across households.

Overall, the evidence suggests that PSNP performs strongly in stabilizing diets and protecting small productive assets but remains constrained by transfer timing, climate shocks, and structural limits on larger-scale accumulation. These findings are consistent with the program functioning as a stabilizing and protective mechanism rather than as an engine of rapid asset growth, reinforcing global lessons about the role – and limits – of social protection in highly vulnerable environments.

## **5. Qualitative insights and mechanisms**

To complement the quantitative analysis, we draw on semi-structured key informant interviews (KIIs) conducted with regional officials, woreda administrators, development agents, and community representatives across SNNPR. Interviews followed a common guide focused on targeting practices, transfer delivery, public works implementation, drought impacts, and household responses. While not intended to be representative, the interviews provide contextual evidence that helps interpret the quantitative patterns and clarify mechanisms behind program effects.

The interviews also serve a diagnostic role by revealing how program design interacts with local administrative capacity. Respondents frequently distinguished between the formal rules of PSNP and the way these rules operate under real-world constraints – limited staffing, seasonal workload pressures, and inconsistent communication between woredas and regional offices. These contextual insights help explain why the same program may achieve strong results in some domains (diet quality, asset protection) but limited progress in others (seasonal hunger, herd expansion).

### ***5.1. Targeting practices and baseline differences***

Respondents explained that targeting blends formal criteria with community and administrative discretion. Although PSNP guidelines emphasize chronic food insecurity and limited assets, households with greater visibility to extension agents or community leaders may be more likely to be selected, while those in remote hamlets can be overlooked despite substantial need. These dynamics reflect the baseline differences between beneficiaries and non-beneficiaries and reinforce the importance of adjusting for observable imbalance when estimating program impacts.

### ***5.2. Why dietary diversity improves but seasonal hunger persists***

Interviewees consistently described PSNP transfers as enabling households to maintain meal quantity and improve dietary quality, especially when food prices rise. This narrative aligns with the sizable gains in dietary diversity observed in the data. Yet respondents also emphasized recurrent payment delays – particularly during drought years or periods of administrative strain – that shift transfers away from the lean season when shortages occur. As one official noted, ‘the hungry period happens before the payment arrives.’ This timing problem helps explain why seasonal food shortages remain largely unchanged even as overall diet quality improves.

### ***5.3. Livestock recovery and constraints on herd expansion***

Development agents highlighted that predictable transfers reduce pressure to sell animals during shocks and allow households to rebuild small-stock herds gradually. Many beneficiaries reportedly used transfers to replace goats or sheep lost in previous bad years, consistent with the strong effects on the extensive margin of livestock ownership. At the same time, limited access to veterinary care, high fodder costs, and repeated droughts restrict the ability to expand herds meaningfully. These constraints echo the

more modest gains in total livestock holdings detected by DRDID and the weaker signals in the DID estimates.

#### **5.4. Administrative capacity and climatic pressures**

Interviews also underscored the role of administrative variation and climate shocks. Staffing shortages, turnover among development agents, and uneven monitoring reduce the consistency of public works and livelihood activities across woredas. Recurrent droughts disrupt both implementation and household livelihoods, often forcing families to divert resources to emergency needs. These pressures help clarify why the program reliably improves diet and supports initial asset rebuilding, yet shows limited influence on outcomes requiring sustained investment or precise timing.

### **6. Conclusion**

This study provides one of the first causal evaluations of PSNP Phase IV in SNNPR using a panel of households observed in 2016 and 2021. The analysis shows that the program delivers meaningful welfare gains even in a region facing severe administrative constraints and repeated droughts. Predictable transfers improve dietary diversity by roughly one-sixth of the baseline level and substantially raise the likelihood of owning livestock – an outcome that reflects reduced distress sales and the gradual rebuilding of small-stock herds. Seasonal food shortages, however, remain largely unaffected, and herd expansion is modest once targeting-related differences are accounted for.

These patterns point to several policy priorities. First, the program's clear success in supporting diet quality underscores the importance of maintaining predictable transfer flows, even under fiscal pressure. Ensuring that payments reach households before the lean season is essential for reducing food gaps. Strengthening the timeliness and reliability of disbursement systems – through digital payments, streamlined verification, or localized contingency funds – could substantially enhance PSNP's stabilizing role.

Second, the gains in livestock ownership and moderate increases in herd size highlight the program's contribution to short-run asset protection. To support more sustained accumulation, complementary services such as veterinary care, improved fodder supply, and climate-resilient livestock management will be necessary. Linking PSNP households more systematically to extension services and livelihood programs could amplify these benefits.

Third, the combination of quantitative and qualitative evidence illustrates how administrative capacity and climate shocks shape household responses. Investments in monitoring, staffing continuity, and drought-responsive mechanisms would help reduce the frictions that limit PSNP's effectiveness.

Overall, PSNP remains a critical instrument for protecting vulnerable households in SNNPR. Enhancing the timeliness of transfers, strengthening complementary services, and bolstering implementation capacity would allow the program to deliver more consistent improvements in food security and asset resilience in the face of increasing climatic pressures.

More broadly, strengthening last-mile delivery systems, particularly in climate-stressed regions, would enhance the reliability of transfers and allow the program's intended seasonal-smoothing function to be realized more fully. The results also highlight the limits of transfers alone in driving long-term asset accumulation. Without complementary services to improve animal health and facilitate climate-adapted livestock practices, households are likely to continue relying on PSNP primarily for protection rather than sustained growth. Strengthening linkages between PSNP, extension systems, and livelihood programs would allow assets to grow and help households transition toward more resilient income sources.

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