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Social Protection and Resilience

The Case of the Productive Safety Net Program in Ethiopia

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Abstract

Improving household resilience is becoming one of the key focus and target of social protection programs in Africa. However, there is surprisingly little direct evidence of the impacts of social protection programs on household resilience measures. We use five rounds of panel data to examine rural households' resilience outcomes associated with participation in Ethiopia's Productive Safety Nets Program (PSNP). Following Cissé and Barrett (2018), we employ a probabilistic moment-based approach for measuring resilience and evaluate the role of PSNP transfers and duration of participation on households' resilience. We document four important findings. First, although PSNP transfers are positively associated with resilience, PSNP transfers below the median are less likely to generate meaningful improvements in resilience. Second, continuous participation in the PSNP participation is associated with higher resilience. Third, combining safety nets with income generating or asset building initiatives may be particularly efficacious at building poor households' resilience. Fourth, our evaluation of both short-term welfare outcomes and longer-term resilience suggests that these outcomes are likely to be driven by different factors, suggesting that optimizing intervention designs for improving short term welfare impacts may not necessarily improve households' resilience, and vice versa. Together, our findings imply that effectively boosting household resilience may require significant transfers over multiple years. National safety nets programs that transfer small amounts to beneficiaries over limited time horizons may not be very effective.

Keywords. Food security, household welfare, resilience, social protection, Ethiopia, PSNP.

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1. Introduction

Improving households' resilience to negative welfare shocks is a top priority of governments in developing countries, as witnessed by the substantial investments in social protection programs in Africa. The primary objective of such programs is to address food insecurity and vulnerability of poor households against various types of shocks by improving their resilience. Ethiopia's Productive Safety Net Program (PSNP) is one of the largest and most studied social protection programs in Africa, aiming to enable food insecure households to smooth consumption and hence prevent asset depletion (Gilligan et al., 2009; Devereux and Guenther, 2009; Hoddinott et al., 2012; Berhane et al., 2014). In many cases, safety net programs in Africa are complemented with various income generating and asset building initiatives (e.g., Beegle et al., 2018). The PSNP in Ethiopia was accompanied by Household Asset Building Program (HABP) that focused on providing agricultural inputs and technical support services to enable households graduate from the PSNP.

Several impact evaluations of social protection programs in Africa, including the PSNP in Ethiopia, show that such interventions can address short-term food gaps and food insecurity (Gilligan et al., 2009; Hoddinott et al., 2012; Berhane et al., 2014; Andrews et al., 2018; Hidrobo et al., 2018). Despite these evaluation studies, there is limited evidence on the ability of social protection programs to improve household resilience, i.e., ''the sustained capacity of an entity to avoid poverty over time'' (Cissé and Barrett, 2018). This is not surprising, given that the conceptualization (and measurement) of resilience is not always well-articulated (Barrett and Constas, 2014; Cissé and Barrett, 2018), and it is generally easier and less expensive to measure short term welfare gains. Most evaluations of social protection programs have focused on the identification of average impacts over a finite time horizon (e.g., Phadera et al., 2019; Knippenberg et al., 2019; Vaitla et al., 2020), with less attention paid to sustained impacts or higher order moments of the conditional distributions of outcomes over time, e.g., conditional variance, which may be more informative about longer-term welfare effects.[1] These "single-shot" studies are unlikely to be sufficiently informative about the extent to which such programs contribute to overall resilience in the context of stochastic environments with high uncertainty (Headey and Barrett, 2015), which typifies the African context. In such contexts, continuous medium- to long-term follow-up of different dimensions of household welfare may be especially important.

[1] Exceptions to this include Phadera et al. (2019), who explicitly quantify the impact of a livestock transfer program on households' resilience following the Cissé and Barrett (2018) method.

Understanding the roles social protection programs can play in enabling poor households to become economically resilient and eventually extricate themselves out of poverty is important for governments and development partners to assess the longer-term returns of investments in such programs. Evaluating the potential of social protection programs to improve household resilience is particularly appealing in the context of global and localized shocks. For example, the COVID-19 pandemic is testing global social protection systems at unprecedented scale and evaluating the potential of these programs to improve households' resilience remains a top priority of policy makers and donors. Although recent evaluations show that social protection programs, including the PSNP, can mitigate some of the adverse impacts of covariate and idiosyncratic shocks (e.g., Knippenberg and Hoddinott, 2017; Banerjee et al., 2020; Abay et al., 2021), we know little about whether these programs sustainably improve households' capacity to avoid slipping into poverty. For example, Phadera et al. (2019) show that although a livestock transfer program improved short-term welfare and asset accumulation, many households have a low likelihood of escaping poverty and hence were less resilient. These findings justify the importance of understanding and quantifying the impact of social protection programs on short-term average welfare outcomes as well as resilience. Similarly, whether combining safety nets with income generating or asset building initiatives such as the HABP in Ethiopia can generate additional gains and effects on households' resilience remains unknown.

In this study, we examine how rural household resilience is correlated with participation in the PSNP and the HABP in Ethiopia, using a probabilistic moment-based approach for measuring resilience (Cissé and Barrett 2018). Using the conditional mean and variance of household welfare, we construct a measure of resilience that serves as an estimate of the probability a household avoids slipping into poverty. This approach allows joint examination of the first and second moments (i.e., the conditional mean and conditional variance) of alternative welfare indicators. This enables us to quantify both the short-term welfare impacts of the PSNP program as well as the potential of the program to pull people out of poverty. For example, an important and interesting question in this setting is knowing the amount of transfer needed to uplift those below the poverty line. To address these questions, we employ alternative measures of household welfare as well as national poverty lines as normative thresholds to estimate households' resilience and hence probability of avoiding slipping into poverty.

Four important findings may be summarized from our analysis. First, we find that although PSNP transfers are associated with improved resilience, major improvements in household resilience will likely require relatively larger transfers. Specifically, per capita PSNP transfers below the median value (ETB 208 per year) are less likely to generate meaningful improvements in resilience. This suggests that although small safety net transfers and light interventions may improve household welfare, boosting household resilience and pulling the poor out of poverty requires significant investment in social protection programs. Second, we find that continuous and persistent participation in the PSNP participation is associated with higher resilience. This implies that improving resilience may require longer-term and continuous investments in safety nets. Third, our results provide suggestive evidence that combining the PSNP and the HABP can generate additional gains in building poor households' resilience. Finally, our evaluation of both short-term welfare outcomes and longer-term resilience suggests that these outcomes are likely to be driven by different factors and hence interventions which generate improvements in household welfare may not necessarily improve households' resilience and vice versa. For example, participation in HABP is associated with higher resilience while the implication of HABP on short-term welfare appears to be negligible.

Our findings have important implications for the design and targeting of social protection programs in Africa. In terms of design, many safety nets programs in Africa generally deliver relatively small transfers to beneficiaries (e.g., Beegle et al., 2018). Although the effect of these small-scale transfers can improve short-term household welfare, those programs and interventions aiming to significantly boost household resilience would need to make transfers at levels that enable the achievement of such objectives. In short, ensuring resilience through social protection programs may require sufficiently large transfers for sustained periods and, thus, program graduation targets based on short-term welfare outcome criteria alone may not be sufficient to bring about significant improvements in the economic resilience of beneficiary households. Our findings also provide some additional insights that may improve the designing, packaging and targeting of social protection programs. For example, the suggestive evidence on the implication of combining safety nets with income generating or asset building initiatives to build poor households' resilience is noteworthy for informing the design of safety net programs in Africa.

2. Social Protection and Complementary Programs in Ethiopia

2.1 The Productive Safety Net Program in Ethiopia

Ethiopia has long been characterized by chronic food insecurity and vulnerability to drought and related shocks. As such, annual emergency appeals were routinely made to prevent humanitarian disasters. Responses to appeals were sometimes unpredictable, delayed or at times inadequate (World Bank, 2004). In 2005, the Government of Ethiopia and a consortium of donors started the Productive Safety Net Program (PSNP) to respond to chronic food insecurity. Replacing the annual appeals, the PSNP was designed as a multi-year program to provide recipients with reliable and predictable transfers. The PSNP thus makes regular transfers to food insecure households to enhance resilience at the household level through bridging consumption gaps and preventing asset depletion in the face of recurrent droughts. At the same time, the PSNP contributes to community level rehabilitation through its labor-intensive public works projects designed to reverse environmental degradation (e.g., via soil and water conservation works) and create community assets (e.g., improving access to roads) (GFDRE, 2004, 2010).

A mix of geographic and community-based targeting is used to identify food insecure participants from areas prone to droughts and prolonged food insecurity (GFDRE, 2010). The PSNP targets *woredas* (districts) which are considered chronically food insecure. At the household level inclusion into the program is based on a series of criteria of which household food insecurity is particularly important. Those households who are historically food insecure, have low household asset holdings (e.g., land, oxen) and limited income from alternative sources of employment are included in the program. Final selection of eligible households is made through community meetings where community members have a say about who should be in the program bases on such agreed upon criteria (Berhane et al., 2014).

While about 80 percent of the PSNP beneficiaries participate in these labor-intensive public work projects to receive transfers, the remaining 20 percent receive unconditional direct transfers as they lacked the labor needed to take part in the public works component (Berhane et al., 2011; Coll-Black et al., 2012; Berhane et al., 2015). The public work component of the program runs for six months between Jan and June.[2] The direct transfer group includes households with members

[2] Despite some variations across regions, participation in the public work follows some guidelines and rules. For example, the maximum number of days and number of family members to participate is fixed. Households are allowed to participate for a maximum of 15 days per month for six months.

who are old or disabled or are children without parents. For households benefiting from the direct support program, the transfer level per month per year is known and fixed.

During the first three phases (2005-2015), the PSNP benefited about 8 million people with a budget of about USD 500 million per year (Gilligan et al., 2009), making it one of the largest social protection programs in sub-Saharan Africa (Slater and McCord, 2013). Since 2005, the PSNP has been operational in the four Highland regions, i.e., Amhara, Oromia, Southern Nations and Nationalities (SNNP) and Tigray, and later expanded to the Lowland regions of Afar and Somali. This study focuses only on the Highland regions. In these regions, public works are conducted between January and June every year, to ensure that these works do not interfere with households' farming activities of the main season and payments are made at the end of each public works month. PSNP payments are made to beneficiaries in the form of food or cash. Early on, PSNP participants received three kilograms of wheat or maize per person per day, or equivalent cash payments, which were set at a uniform wage rate of six birr per day. However, since 2014, adjustments were made to keep up with inflation ((GFDRE, 2010; Berhane et al., 2015).

The PSNP has passed through three phases between 2005 and 2015, the period covered in this study.[3] Several studies have evaluated the PSNP's impacts on a number of outcomes during the same period, including on food security, food consumption, assets, agricultural productivity, and child nutritional outcomes (Gilligan et al., 2009; Andersson et al., 2011; Hoddinott et al. 2012; Berhane et al., 2014; Hill and Tsehaye, 2014; Berhane et al., 2016; Knippenberg and Hoddinott, 2017). While evaluations of the first phase of the program showed little impact on beneficiaries (Gilligan et al., 2009), the more recent evaluations show that the program has reduced household food insecurity and distress sale of assets, increased household expenditures and uptake of agricultural inputs (Hoddinott et al., 2012; Berhane et al., 2014; Berhane et al., 2016). Some studies also show that the PSNP reduces poverty and vulnerability to drought (Hill and Tsehaye, 2014) while also facilitating recovery when drought hits (Knippenberg and Hoddinott, 2017). Using general equilibrium impact assessment method, Filipski et al. (2017) show that the PSNP increased productivity as a result of the public works component that builds and restores community assets. While these studies have documented important findings related to the impacts of the PSNP on

[3] The fourth phase of the PSNP has continued after 2015, with additional nutrition-sensitive features added to it (Berhane et al., 2020). The previous three phases remained largely the same in design and approach, and phases reflected programming periods.

several household outcomes, evidence on the extent to which the PSNP has contributed to overall household resilience is limited.

2.2 The Household Asset Building Program and Other Complementary Food Security Programs

The PSNP was designed to protect existing assets by ensuring access to minimum level of consumption. In the first three phases (2005-2015), the PSNP was complemented by other complementary food security programs (OFSP) which mainly aim to support chronically food insecure households build up their assets and improve their livelihoods. These programs mostly facilitate access to credit services and technical support, including on use of improved agricultural inputs, beekeeping, livestock production, and soil and water conservation activities. These complementary OFSP activities and initiatives were later repackaged and named as the Household Asset Building Program (HABP). While these complementary OFSPs were in place early on, the HABP has been significantly overhauled to address implementation challenges and limitations of these food security programs in 2009 (Gilligan et al., 2009). Important components of the HABP and OFSP were the provision of access to credit and technical support services through which households can increase their agricultural incomes and build assets (Berhane et al., 2014).

As part of the HABP initiative the PSNP was anchored on two major institutional infrastructures. First, microfinance institutions (MFI) and rural saving and credit cooperatives (RUSACCOs) were tasked to facilitate the provision of credit services. These credit services were major source of finance for supporting productive agricultural investments. Second, the PSNP was piggybacked on the Development Agent (DA)-led national agricultural extension system stationed in each *kebele* (village) center for technical support services. The extension system deployed three to five DAs specializing in crop sciences, animal husbandry, natural resources, and soil and water management practices. The success of the HABP's technical support was thus largely premised on the effectiveness of the DA-led extension system for provision of technical support as well as MFI and RUSACCOs for delivering credit and related financial services. While the HABP was mainly designed to benefit PSNP beneficiaries, PSNP non-beneficiary households also received similar services through the national agricultural extension system and MFIs (GFDRE, 2009).

Complementary productivity-enhancing and asset building initiatives are becoming popular and hence being integrated as part of many flagship safety net programs (e.g., Beegle et al., 2018; Ulriksen, 2016). Despite variations in content, many social protection programs in Africa

are being complemented by alternative rural development activities that can support households' access to financial services and rural development services.[4] Facilitating access to financial services, credit and extension services can improve the effectiveness of safety net transfers and hence improve households' resilience. These initiatives can also facilitate graduation and hence engagement in more productive and remunerative sectors and activities.

Overall, although complementing the PSNP with the HABP and OFSP was a noble idea, the potentials of OFSP and HABP have been limited by implementation challenges surrounding capacity and resource constraints of the extension system in Ethiopia. Nevertheless, Berhane et al. (2014) document the synergy and value of combining PSNP with OFSP/HABP and found additional gains in food security and livestock holdings for those households who had access to both the PSNP and the HABP. Berhane et al. (2014) noted the main challenge in the implementation of the HABP was that the agricultural extension system was under resourced, and DAs did not have the specific trainings or skills needed to support the HABP and OFSP effectively. Providing prioritized access to credit to poor PSNP households as per the design in the HABP and ensuring repayment also involved considerable challenges (Berhane et al., 2014).

In this paper we focus on identifying the complementary roles of the HABP and OFSP on households' resilience. For this purpose, we create binary indicators of participation in HABP that we employ to explore the implication of joint participation in PSNP and HABP. Access to the HABP is defined as receiving technical support from a DA (including advice on various agricultural activities, including irrigation, livestock production and business activities) or receiving access to credit as part of the HABP or OFSP. PSNP households receiving technical support or credit services as part of the HABP (or OFSP) are categorized as HABP beneficiaries. However, although PSNP beneficiaries were prioritized in accessing HABP and OFSP, PSNP non-beneficiaries were also accessing some of these technical and credit services, mainly because the HABP and OFSP build on existing MFI, RUSACCOs and national agricultural extension infrastructure. Hence, participation in HABP may entail self-selection by PSNP beneficiaries and non-beneficiaries.

[4] For example, the Vision 2020 Umurenge Program (VUP) in Rwanda links beneficiary households to financial services, while the Hunger Safety Net Program (HSNP) in Kenya links beneficiaries to various rural development programs (e.g., Beegle et al., 2018).

3. Measuring Resilience: Concepts and Methods

The concept of resilience has a long history in many fields, including ecology and psychology.[5] In terms of a social-ecological perspective, resilience is defined as the capacity of socioeconomic systems or entities (such as households) to withstand shocks and disturbances through absorption, adaptation and transformation (Holling, 1973; Walker et al., 2006; Folke, 2006; Gunderson, 2000). A slightly related definition of resilience is the capacity of a system or an entity (e.g., household) to persist perturbations and maintain functionality during shocks. Along this definition, resilience has been applied in various contexts to understand whether and how economic systems could withstand recurrent shocks (Barrett and Constas, 2014; Doran and Fingleton, 2016; Folke, 2006; Martin and Sunley, 2014). Another strand of literature conceptualizes resilience as the speed of adjustment to a pre-existing equilibrium following a significant shock (Pimm, 1984; Perrings, 2006). Across various disciplines and definitions, a common feature of resilience appears to be the capacity to sustainably withstand stressors or shocks over time.

The last decade has seen major applications and tractions to understanding and measuring resilience. Many development and humanitarian agencies are rapidly embracing the concept of resilience and hence investing large amounts of funding for programming and research to build resilience of communities and households. Resilience is also being included as a core element of strategic plans across United Nations agencies and other non-governmental organizations (Barrett et al., 2021). Reflecting this increasing interest in resilience, a growing body of literature has emerged on development resilience, with an attempt articulate it conceptually (Barrett and Constas, 2014; Constas et al., 2014a; Constas et al., 2014b), and empirically (e.g., Cissé and Barrett, 2018; Upton et al., 2016). In general, the way resilience is conceptualized and measured in the literature can be categorized into three broad groups (Barret et al., 2021): (1) resilience as capacity to withstand exposure to negative stressors or shocks; (2) resilience as return to equilibrium; and (3) resilience as a normative condition (i.e., the sustained capacity of an entity to avoid falling below some normative threshold of living standard).

The first approach considers resilience as the capacity that protects systems and entities (e.g., households) from potential long-lasting adverse effects of stressors and shocks (Constas et al., 2014; Birhanu et al., 2017). This conceptualization usually considers resilience as a latent

[5] Barrett et al. (2021) provides a recent review of the development resilience literature, focusing on the theories, methods, and resulting analytical conclusions regarding resilience in rural development contexts.

capacity to limit or absorb the long-term adverse effects of shocks, a capacity that may shaped and influenced by a host of observable and unobservable attributes of systems (e.g., households) (Constas et al., 2014; Barrett et al., 2021). Practically, operationalizing resilience as a capacity usually entails deploying a multidimensional set of indicators and attributes thought to capture various features and types of capacities (e.g., Birhanu et al, 2017; Quandt, 2019; Saxena et al, 2016; Woolf et al, 2016; Béné, 2013).

The second approach to measuring and operationalizing resilience considers resilience as a system's capacity to return to equilibrium and hence pays greater attention to assessing the *ex-post* effects of shocks on well-being outcomes and associated capacity to recover from a shock (Constas et al., 2014a; Constas et al., 2014b; Vollenweider, 2015; Hoddinott, 2014; Knippenberg et al., 2019). This approach attributes resilience as the *ex-post* recovering capacity of systems (e.g., households) once they experience stressors and shocks.[6]

In the context of empirical impact evaluations, the above two conceptual approaches have important limitations to quantify the impact of specific interventions that aim at building resilience. Those approaches measuring as resilience as *ex-ant* absorptive capacity or *ex-post* recovering capacity of systems lack direct outcome of interest and rather position resilience as a latent variable that amplifies or explains variations in impacts of shocks and stressors. In many cases, this latent capacity may be difficult to observe and capture in surveys, making empirical identification of these factors challenging.

The third approach, resilience as a normative condition, adds an important benchmark and anchor the concept of resilience against normative living standards, including poverty lines or a minimum daily caloric requirement and related benchmarks. Such type of benchmarking can ensure that resilience is evaluated against some normative thresholds and meaningful benchmarks (Barrett and Constas, 2014; Béné et al., 2015). This approach addresses some of the above limitations associated with the two types of measuring and operationalizing resilience because it creates a direct outcome and measure of resilience. This outcome-based measurement can facilitate empirical identification of impacts of specific interventions on building resilience. Barrett and

[6] Interpreting "resilience as recovery" to pre-shock equilibrium may necessitate understanding whether the *ex-ante* (pre-shock) state was desirable or not (Barrett and Constas, 2014). For example, while the PSNP program in Ethiopia targets the poor and aims to protect them from falling further into poverty, the pre-shock equilibrium in the sample is less likely to be considered as desirable.

Constas (2014) develop the "resilience as a normative condition" idea in detail, conceptualizing resilience as an individual's probability to achieve some minimal threshold of living standard and well-being. Cissé and Barrett (2018) translate this conceptualization into an econometric method, estimating resilience using conditional mean and variance of a well-being indicator as well as some distributional assumptions on the distribution of a particular welfare indicator.

Our study follows Barrett and Constas's (2014) conceptualization of resilience and Cissé and Barrett's (2018) econometric method for estimating household and period-specific probability of achieving minimum standard of living. In this paper, we exploit the methodological and operational advantage of this approach and evaluate the implication of the PSNP on rural households' resilience in Ethiopia.

4. Data and Descriptive Statistics

This study uses five rounds of unique household panel data collected as part of the evaluation of the PSNP by the Central Statistics Agency (CSA) of Ethiopia in collaboration with the International Food Policy Research Institute (IFPRI). The datasets were collected bi-annually (2006, 2008, 2010, 2012, and 2014) from the four Highland regions: Amhara, Oromiya, SNNP and Tigray. The first-round sample was drawn from a list of kebeles in chronically food-insecure woredas involving two-stage clustered sampling. First, 2-3 PSNP beneficiary *kebeles* were randomly drawn from 68 *woredas* that were randomly drawn from a total of 153 food-insecure *woredas* in the four main regions.[7] In each *kebele* an exhaustive list of PSNP beneficiaries and "comparably poor" non-PSNP beneficiaries were constructed.[8] Second, 15 PSNP beneficiaries and 10 non-beneficiaries were randomly selected from an exhaustive list of beneficiaries and non-beneficiaries in each *kebele*.[9] Based on this procedure the initial survey yielded about 3,700 households from 146 *kebeles*. However, because a few sampled households were not interviewed, the actual sample households are 3,688 in 2006. There were also additional replacement households included in subsequent rounds (see Berhane et al., 2011 for details). Overall, the 2008

[7] The number of *woredas* increased in the later rounds.

[8] This was made based on self-reported subjective poverty status reported by households. Households were asked to rank themselves on a seven rung poverty ladder. The first rung represented the very poorest households in the village and the seventh rung, the very richest households in the village. Those households deemed to be poor and hence falling in the bottom four rungs of the ranking comprises our complete list of "comparably poor" non-PSNP beneficiaries.

[9] See Gilligan et al. (2009) for a comprehensive description of the data and sample design in 2006. In addition, see Berhane et al. (2011 and 2015) for a more detailed discussion of the follow up surveys in 2008, 2010, 2012, and 2014.

survey generated data on 4,718 households. In 2010, 4, 628 households were interviewed. After the 2010 survey there was a need to add fresh sample of households to compensate for sample attrition due to several reasons. Consequently, the 2012 and 2014 survey rounds generated data on 5,092 and 5,287 households, respectively. The availability of large-scale and long-ranging panel data offer unique opportunity to evaluate longer-term welfare outcomes of rural households.

All the five rounds of the survey were fielded around the same timing (i.e., June/July), which helps to avoid seasonality differences across rounds and ensure comparability. In addition, the structure and content of the questionnaires remained largely unchanged across survey rounds allowing comparability over time and across questions asked in the survey. Further, attrition in the sample was low, especially considering the physical inaccessibility of many of the localities and the fact that this is the first longitudinal survey conducted by the CSA (Berhane et al., 2011). Table 1 presents descriptive statistics of the key explanatory variables across the five survey rounds, for those households with complete information on these observable characteristics.[10] Majority, more than 70 percent, of the households are male headed with average age of 45 to 51 years, married and no formal education. The average household size in the sample is also about 5 members. The main occupation of most households is farming and less than 5 percent of household heads are engaged in non-farm activities as main occupation.

PSNP participation has varied across rounds, ranging from 51 percent in the first round to 32 percent in the last round. On average PSNP beneficiary households received PSNP transfers ranging from 746 Ethiopian Birr in the second round to 1972 Ethiopian Birr in the fourth round. [11] On per capita basis this translates to 144 Birr in the second round to 410 Birr in the fourth round. The overall (pooled) mean and median per capita transfers remain low, amounting 287 and 208, respectively. Public works associated with PSNP transfers are conducted between January and June every year, and most PSNP payments are made at the end of each month. Thus, the PSNP does not run throughout the year and the payment we are using in this analysis are total payments (in each round) received by the household during this period (January to June).

Participation in HABP and related food security programs ranged from 27 percent in 2006 to 55 percent in the 2012. The repackaging and rebranding of all complementary food security

[10] We dropped households with missing information on one or more of the observable characteristics in Table 1. This resulted in reduction in the sample size, compared to the originally interviewed households.
[11] At the latest round of the survey (2014) 1 USD ≈ 17 Birr.

programs into HABP in 2009 has significantly increased participation in HABP after 2009. Our definition of HABP participation is relatively inclusive as our definition includes those receiving any technical support or credit services from the HABP or related OFSP. This definition may imply that on average participation in the HABP without PSNP may not trigger major impact because households may be receiving marginal support or credit service that may not significantly improve households' welfare. However, we expect that participation in both HABP and PSNP may improve households' welfare and resilience. To evaluate the joint implication of participation in PSNP and HABP we created an indicator variable that capture participation in both programs. About 18 percent of households participated in both programs, ranging from about 16 percent in 2006 to 24 percent in 2012.

Table 1: Descriptive statistics

	2006	2008	2010	2012	2014	Pooled
Annual real consumption, PAE	4746.3	3714.2	6366.0	7418.7	8847.8	6348.7
	(4099.4)	(3255.6)	(5580.7)	(7506.8)	(9373.4)	(6788.5)
Annual food consumption, PAE	3449.1	3121.1	5161.7	5887.1	7393.4	5127.7
	(3244.9)	(3048.7)	(5102.8)	(6893.2)	(8757.9)	(6205.5)
Log(consumption per adult)	8.187	7.977	8.504	8.640	8.754	8.432
	(0.778)	(0.692)	(0.704)	(0.700)	(0.810)	(0.792)
Log(food consumption per adult)	7.816	7.752	8.242	8.340	8.506	8.155
	(0.856)	(0.786)	(0.793)	(0.798)	(0.906)	(0.879)
Male headed household	0.796	0.804	0.784	0.758	0.781	0.784
	(0.403)	(0.397)	(0.412)	(0.428)	(0.413)	(0.412)
Log (age of household head)	3.743	3.788	3.817	3.870	3.875	3.824
	(0.341)	(0.319)	(0.314)	(0.299)	(0.284)	(0.314)
Household head no education	0.762	0.766	0.494	0.689	0.747	0.689
	(0.426)	(0.424)	(0.500)	(0.463)	(0.435)	(0.463)
Marital status (married)	0.741	0.780	0.754	0.724	0.761	0.752
	(0.438)	(0.414)	(0.431)	(0.447)	(0.427)	(0.432)
Household size	5.178	5.406	5.461	5.358	5.465	5.384
	(2.160)	(2.181)	(2.186)	(2.208)	(2.179)	(2.186)
Main occupation farming	0.862	0.884	0.840	0.841	0.848	0.854
	(0.345)	(0.320)	(0.367)	(0.365)	(0.359)	(0.353)
Main occupation non-farming	0.0396	0.0316	0.0402	0.0299	0.0129	0.0301
	(0.195)	(0.175)	(0.197)	(0.170)	(0.113)	(0.171)
Log (land size)	-1.390	-1.452	-1.320	-1.398	-1.481	-1.410
	(0.867)	(0.940)	(0.796)	(0.858)	(0.817)	(0.858)
Log (value of livestock per adult)	8.780	8.162	8.728	8.953	9.082	8.748
	(1.500)	(1.467)	(1.465)	(1.542)	(1.457)	(1.520)
Log (value of productive assets per adult)	4.322	3.774	4.617	4.741	4.761	4.459
	(1.220)	(1.116)	(1.115)	(1.144)	(1.092)	(1.194)
Household has access to electricity	0.0412	0.140	0.153	0.188	0.301	0.173
	(0.199)	(0.347)	(0.360)	(0.391)	(0.459)	(0.378)
Log (distance to nearest town)	2.459	2.400	2.426	2.411	2.394	2.416
	(0.811)	(0.880)	(0.871)	(0.860)	(0.868)	(0.861)
PSNP member household	0.509	0.355	0.351	0.374	0.319	0.375
	(0.500)	(0.478)	(0.477)	(0.484)	(0.466)	(0.484)
PSNP transfer per household	1238.6	745.9	1097.0	1972.4	1825.0	1385.9
	(1159.6)	(710.7)	(1178.4)	(1505.0)	(1481.6)	(1326.6)
PSNP transfer per household member	255.6	144.2	222.6	410.1	390.7	286.7
	(233.1)	(126.4)	(247.9)	(298.0)	(338.5)	(278.0)
IHS (PNSP transfer per household member)	2.990	1.895	1.938	2.419	2.026	2.218
	(3.006)	(2.606)	(2.728)	(3.164)	(2.999)	(2.933)
HABP beneficiary household	0.274	0.390	0.553	0.540	0.517	0.466
	(0.446)	(0.488)	(0.497)	(0.498)	(0.500)	(0.499)
PSNP and HABP beneficiary household	0.157	0.160	0.198	0.240	0.173	0.187
	(0.364)	(0.367)	(0.399)	(0.427)	(0.378)	(0.390)
Number of observations	3106	4022	4050	4315	4356	19849

Source: PSNP survey in 2006, 2008, 2010, 2012, and 2014.

Notes: The average PSNP transfers per household and per household member are computed conditional on PSNP participation. Values in parenthesis are standard deviations. IHS stands for inverse hyperbolic sine transformation of PSNP transfers. By this transformation, PSNP non-beneficiaries assume a value of 0.

We note that all monetary values in Table 1 are expressed in real terms, 2014 constant prices. This includes welfare outcomes as well as values of assets. We also converted all other monetary values, including national poverty lines as well as PSNP transfers accordingly. For example, the national poverty line for Ethiopia was 3781 Ethiopian Birr in 2011 which is equivalent to 4930.4 in 2014 prices (World Bank, 2015). Similarly, the national food poverty line was 1985 Ethiopian Birr which is equivalent to 2588.4 in 2014 prices. We are going to employ these thresholds for computing the share of absolute people (Table 2) and our probabilistic measure of resilience.

Table 2 provides poverty dynamics of the households based on consumption expenditure per adult equivalent relative to the minimum per capita requirement (national poverty line). We provide these poverty rates across six groups of households: PSNP non-beneficiaries, PSNP beneficiaries, HABP beneficiaries, PSNP and HABP beneficiaries, PSNP beneficiaries receiving below median transfers and PSNP beneficiaries receiving above median transfer. We note that poverty rates are much higher than national averages because our sample covers the poorest portion of the Ethiopian population. Across all groups, poverty rate was most prevalent in the first two rounds before it substantially fall during the subsequent years. The incidence of poverty appears to be generally comparable between PSNP and HABP beneficiaries and non-beneficiaries. This may be attributed to the sampling strategy that aimed to create a balanced sample of PSNP beneficiaries and poor non-beneficiaries. The major difference appears to be across those receiving above and below the median PSNP transfer. Incidence of poverty is significantly lower among the PSNP beneficiaries who received above the median transfers compared to the PSNP beneficiaries who received below the median transfers and PSNP non-beneficiaries.

Table 2: Poverty dynamics by PSNP and HABP status and year

	(1) PSNP non-beneficiaries	(2) PSNP beneficiaries	(3) HABP beneficiaries	(4) PSNP and HABP beneficiaries	(5) PSNP beneficiaries (below median)	(6) PSNP beneficiaries (above median)
Round	Absolute poor	Absolute poor	Absolute poor	Absolute poor	Absolute poor	Absolute poor
2006	0.63	0.68	0.55	0.58	0.76	0.57
2008	0.78	0.77	0.78	0.74	0.78	0.70
2010	0.50	0.51	0.52	0.53	0.53	0.49
2012	0.44	0.45	0.47	0.46	0.53	0.43
2014	0.37	0.37	0.38	0.40	0.45	0.34
Pooled	0.53	0.56	0.52	0.53	0.65	0.46

Source: Authors' computation based on household surveys in 2006, 2008, 2010, 2012, and 2014.
Notes: This table provides the share of absolute poor households in our sample. Absolute poor are those households whose consumption expenditure falls below the national poverty line (4930.4 Ethiopian Birr in 2014 constant price).

Figure 1 provides Kernel density of the distribution of household welfare, both in levels and in their logarithmic values. The first two graphs show distributions of overall consumption and food consumption expenditure per adult, in levels. We plot these density functions for PSNP beneficiaries, non-beneficiaries and PSNP plus HABP beneficiaries to uncover potential differences in the distribution of welfare across beneficiaries and non-beneficiaries of these programs. The welfare distribution of the three groups of households appears to be reasonably comparable. Those households benefiting from PSNP and HABP programs report slightly higher welfare (consumption). The last two graphs provide the distribution of logarithmic values of overall consumption and food consumption expenditure per adult. These density functions suggest that household welfare follows a lognormal distribution in levels and hence normal distribution in logarithmic values. These distributional assumptions are used to compute our probabilistic measure of resilience, the probability that a household's welfare satisfies a minimum normative living standard.

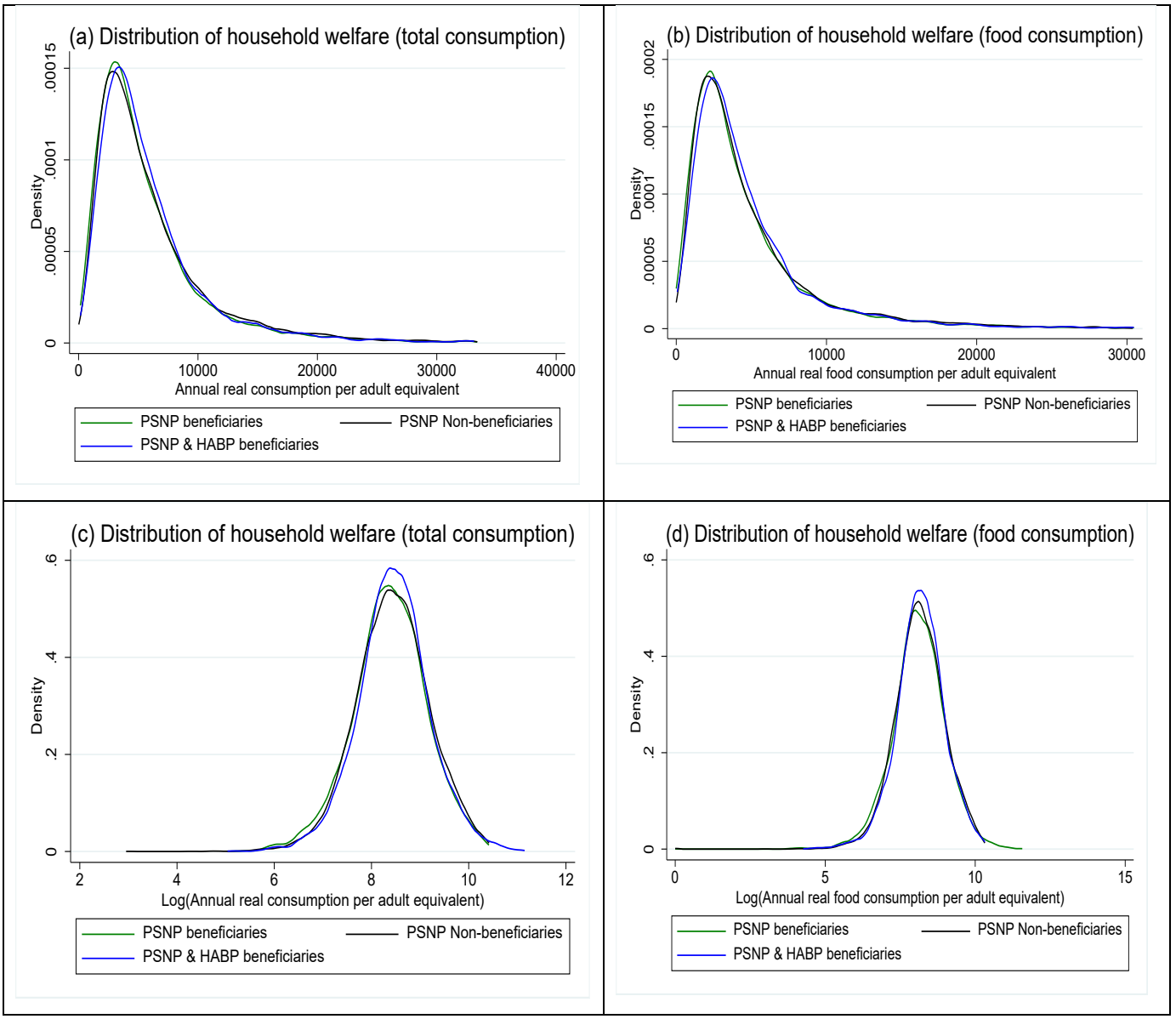

Figure 1: Kernel density of the distribution of household welfare.

5. Empirical Strategy: Moment-based Development Resilience Estimation

In this study, we adopt a probabilistic moment-based approach to assess the role of PSNP on households' resilience, following Cissé and Barrett (2018). This approach employs the first two moments of households' welfare outcomes, i.e., the conditional mean and conditional variance, to characterize household resilience. This estimation involves three steps. First, we estimate the expected welfare of households in each period (W_{it}) as a polynomial function (g_m) of lagged welfare (W_{it-1}) as well as a vector of household and community characteristics (X_{it}). Welfare outcomes are modeled as a function of first order and higher order polynomials of lagged welfare states. Furthermore, we include our main treatment indicator, PSNP participation, as well as associated PSNP transfers as follows.

$$W_{it} = \alpha_m + g_m(W_{it-1}) + \beta_m' X_{it} + \gamma_m PSNP_{it} + \delta_m PSNP_{Transfer_{it}} + \theta_m HABP_{it} + \varphi_m PSNP_{it} * HABP_{it} + u_{mit} \quad (1)$$

where α_m stands for a constant term and W_{it-1} is lagged welfare outcome from the previous round and X_{it} is a vector of household and community-level characteristics. We note that due to significant persistence in welfare dynamics including lagged welfare is likely to capture significant heterogeneities in static welfare across households.[12] $PSNP_{it}$ stands for an indicator variable assuming a value of 1 for those households receiving PSNP transfers and 0 otherwise. $PSNP\_Transfer_{it}$ stands for amount of PSNP transfer received, per household member. We include both binary participation indicator as well as levels of PSNP transfers to identify differential implication of program participation, depending on the levels of transfers received. $HABP_{it}$ captures participation in the complementary HABP and related complementary initiatives. As we are mostly interested in the complementary role of income generating and asset building programs, we interact PSNP and HABP participation. u_{mit} is a mean zero error term. We measure welfare outcomes using overall consumption per adult equivalence as well as food consumption per adult equivalence. Using the parameters from equation (1) one can predict conditional mean welfare for each household and round as follows $\hat{\mu}_{1it} = g_m(W_{it-1}) + \hat{\beta}_m' X_{it} + \hat{\gamma}_m PSNP_{it} + \hat{\delta}_m PSNP\_Transfer_{it} + \hat{\theta}_m HABP_{it} + \hat{\varphi}_m PSNP_{it} * HABP_{it}$.

[12] In principle, one could also add second and third-order lags, but empirically this is not necessary if welfare outcomes are sufficiently persistent. Furthermore, adding higher order time lags reduces the effective sample size, through the loss of survey rounds available for analysis of the outcomes of interest.

In the second step, we model variation in the dispersion of welfare (the second moment). We assume a similar specification to that shown in equation (1) to characterize the variance of household welfare. Taking the residuals from the regression estimation of equation (1) and squaring them provides an estimate of the variance of household welfare ($\sigma_{it}^2 = E[\hat{u}_{mit}^2]$), which we characterize using the following empirical specification:

$$\sigma_{it}^2 = E[\hat{u}_{mit}^2] = \alpha_v + g_v(W_{it-1}) + \beta_v' X_{it} + \gamma_v PSNP_{it} + \delta_v PSNP_{Transfer_{it}} + \theta_v HABP_{it} + \varphi_v PSNP_{it} * HABP_{it} + u_{vit} \quad (2)$$

Where all terms are as defined in equation (1), with the subscript *v* denoting variance. Using the expression in equation (2) we then predict conditional variance for each household and round as follows: $\hat{\mu}_{2it} = \hat{\sigma}_{it}^2 = g_v(W_{it-1}) + \hat{\beta}_v' X_{it} + \hat{\gamma}_v PSNP_{it} + \hat{\delta}_v PSNP\_Transfer_{it} + \hat{\theta}_v HABP_{it} + \hat{\varphi}_v PSNP_{it} * HABP_{it}$.

Finally, we estimate households' resilience (ρ_{it}) by estimating the conditional probability that a household welfare in time t lies above a normative threshold $\underline{W}$. Assuming some distributional assumptions about W_{it} and using the conditional mean and conditional variance estimated using equation (1)-(2), we can estimate household-and-period-specific probability that a household's welfare satisfies a minimum standard $\underline{W}$. We can then evaluate the role of PSNP participation and associated transfers on household welfare as follows:

$$\hat{\rho}_{it} = P(W_{it} \geq \underline{W} \mid W_{it-1}, X_{it}, PSNP_{it}, HABP_{it}) = \bar{F}_{Wit}(\underline{W};\ \hat{\mu}_{1it},\ \hat{\mu}_{2it}) = \alpha_\rho + g_\rho(W_{it-1}) + \beta_\rho' X_{it} + \gamma_\rho PSNP_{it} + \delta_\rho PSNP\_Transfer_{it} + \theta_\rho HABP_{it} + \varphi_\rho PSNP_{it} * HABP_{it} + u_{\rho it} \quad (3)$$

where $\bar{F}_{Wit}$ is the cumulative distribution function of the corresponding welfare outcome of interest. Following the patterns and distribution of total consumption and food consumption expenditure in Figure 1 we assume a lognormal distribution when modelling welfare outcomes in levels (and hence normal distribution when modelling log-transformed consumption values). We define the normative thresholds to be overall national poverty line and food poverty lines for Ethiopia (see World Bank, 2015). These are intuitive normative wellbeing thresholds because the overall national poverty and food poverty lines are defined considering the costs of satisfying basic food and non-food needs. These metrics are commonly used as programming benchmarks in several national interventions and programming, including the PSNP. For example, the food poverty line in Ethiopia is estimated as the cost of a bundle of food items that provides a minimum daily caloric requirement (2200 kcal) aggregated over a year in per adult equivalent terms. Thus, we estimate two measures of households' resilience considering

these two normative thresholds. The first measure of resilience captures households' probability of meeting the minimum food and basic non-food needs of households. The second measure of resilience captures households' probability of satisfying the minimum calorie requirement for an active life. Deploying two normative well-being thresholds and hence estimating two measures and indicators of household resilience helps to probe the robustness of our results.

We are interested in examining the implication of PNSP participation as well as associated levels of transfers on households' resilience. This can help us identify potential nonlinearities and differential implications of the levels of transfers. For example, small transfers may not significantly contribute to improving household's resilience. Compared to non-beneficiaries, PSNP participants are likely poorer and less resilient without the transfer. But additional investments in social safety nets and hence PSNP transfers can improve beneficiaries' resilience. Including both the PSNP participation indicator as well as levels of transfers allow us to identify the transfer levels needed to make the welfare and resilience of PSNP beneficiaries comparable or above non-beneficiaries.

The concept of resilience is commonly associated with longer-term well-being in the face of a myriad of shocks (e.g., Barrett et al., 2021) and hence cumulative investments in human well-being are likely to shape households' resilience. Thus, assessing the cumulative effects of continuous (or repeated) participation in social protection programs on households' resilience is particularly interesting. For this purpose, we extend the empirical specification in equation (3) by introducing and interacting households' previous exposure to the PSNP program with current transfers to identify if continuous participation or duration of participation boosts households' resilience.

$$\hat{\rho}_{it} = \alpha_l + g_l(W_{it-1}) + \beta_l' X_{it} + \gamma_{l0} PSNP_{it-1} + \gamma_{l1} PSNP_{it} +$$

$$+\delta_{l0} PSNP_{Transfer_{it}} + \delta_{l1} PSNP_{Transfer_{it}} * PSNP_{it-1} + \theta_{l0} HABP_{it} + \varphi_l PSNP_{it} * HABP_{it} + u_{lit} \quad (4)$$

where all variables and definitions, except $PSNP_{it-1}$, are as described above. $PSNP_{it-1}$ stands for *PSNP* participation in the last round. The interaction term and associated coefficient, δ_{l1}, captures the role of previous and hence continuous participation in the PSNP program. If sustained program participation generates additional gains in resilience, we would expect δ_{l1} to be positive and statistically significant.

6. Estimation Results and Discussion

6.1 PSNP Participation and Household Resilience

Before presenting and interpreting our main results, the following details are in order. First, we experimented various functional forms and specifications for $g_m(.), g_v(.)$ and $g_\rho(.)$, considering different lag lengths and orders of polynomials to capture nonlinear dynamics and persistence. After controlling for the first lag, subsequent lags are largely insignificant, suggesting that temporal dynamics are mostly captured by a single lag term.[13] We also find that higher order polynomials associated with the first lag appear to be statistically insignificant. Second, earlier studies have demonstrated that PSNP participation is largely based on observable criteria, including asset ownership, landholding, livestock ownership and income from farm and non-farm activities (Gilligan et al., 2009; Hoddinott et al., 2012; Berhane et al., 2014). We control for these selection criteria in our empirical specification, along with lagged welfare outcomes as well as comprehensive set of geographic indicator variables.[14] However, we still believe that our estimates may not carry pure causal effects because of remaining sources of endogeneity that may affect extensive and intensive margins of PSNP participation. Although the number of transfers (and levels) received are determined by the number of days households participate in public works and maximum number of days to participate is fixed, households may endogenously respond to some dimensions of the program. For example, households can endogenously decide the amount of labor supply to public works. While we are cautious about claiming causal identification of PSNP impacts, the associational evidence on the relationship between participation in social safety nets and households' resilience is informative. Assessing whether complementary asset building activities are associated with additional improvements in resilience can also inform programing of safety net programs. Estimating such a relationship across the continuous distribution of PSNP transfers can inform the level of transfer needed to improve households' resilience. PSNP participation may improve short-term household welfare without improving longer-term households' resilience and hence without helping households avoid falling into poverty. For this purpose, we control for PSNP participation as well as level of transfers received. Similarly, we also control for participation in both HABP and PSNP.

[13] In the presence of substantial persistence in welfare outcomes, lagged welfare outcomes capture significant time-invariant unobserved heterogeneities across households and PSNP status differences.

[14] Communities are given some discretion in the selection of households into the PSNP program and controlling for these geographic (district) fixed effects can capture some of these differences in targeting and implementation of the PSNP.

Following the empirical approaches and steps described in equation (1)-(3) we compute households' resilience using the two normative thresholds, the national poverty line and national food poverty line. Before modelling the distribution of these resilience estimates across observable characteristics of households, including PSNP participation, we provide a summary of these values across years and beneficiary groups, which enables us to uncover potential differences across these groups .[15] We disaggregate these estimates across four groups: (i) PSNP non-beneficiaries, (ii) PSNP beneficiaries but receiving below the median transfer, (iii) PSNP beneficiaries and receiving above the median transfer, and (iv) PSNP and HABP participants. Table 3 presents summary of the resilience estimates by these categories. Three intuitive insights can be summarized. First, households' resilience against the normative food poverty line is significantly larger than their resilience against the overall poverty line, mainly because the national food poverty line for Ethiopia is much smaller than the overall poverty line. Second, resilience increases across rounds, consistent with the significant progress in poverty alleviation in Ethiopia over the last few decades. Third, and most importantly, PSNP beneficiaries receiving above median transfers show significantly higher resilience than those receiving below median transfers. Indeed, PSNP beneficiaries receiving below the median transfer are less resilient than the non-beneficiary households. This provides suggestive evidence that PSNP beneficiaries receiving small transfers are not likely to enjoy significant gains in building their resilience. Those households participating both in PSNP and HABP are also slightly more resilient than those receiving below median PSNP transfers, especially in the latter rounds of the survey. In Section 5.3, we explore these patterns further, including in terms of suggestive evidence about the threshold level of transfer that improves household resilience.

[15] As we are including first lagged values, we lost one year in our sample and hence we cannot estimate households' resilience for the first-round households.

Table 3: Estimated household resilience, considering alternative normative thresholds.

	Resilience against overall poverty				Resilience against food poverty			
Round	PSNP non-beneficiaries (1)	PSNP beneficiaries (below median) (2)	PSNP beneficiaries (above median) (3)	PSNP and HABP beneficiaries (4)	PSNP non-beneficiaries (1)	PSNP beneficiaries (below median) (2)	PSNP beneficiaries (above median) (3)	PSNP and HABP beneficiaries (4)
2006	-		-	-	-		-	-
2008	0.27	0.20	0.27	0.22	0.48	0.42	0.48	0.45
2010	0.49	0.49	0.52	0.49	0.68	0.69	0.68	0.68
2012	0.58	0.50	0.58	0.56	0.74	0.70	0.73	0.72
2014	0.63	0.57	0.64	0.60	0.78	0.74	0.78	0.76
Pooled	0.52	0.38	0.56	0.48	0.69	0.59	0.72	0.67

Source: Household surveys in 2006, 2008, 2010, 2012, and 2014.
Notes: As we are controlling for lagged welfare, we cannot estimate households' resilience for the first round of the survey.

Figure 2 provides the distribution of resilience estimates across various groups of households.[16] These graphs show clear distinction in the distribution of resilience across PSNP beneficiaries and non-beneficiaries as well as across those who received above and below median transfer. PSNP transfers above the median value are likely to be contributing to build household resilience. PSNP beneficiaries are usually poor households and hence without sufficient transfers they will be less resilient, even compared to non-beneficiary households. Participation in PSNP and HABP is also associated with higher resilience, although the level of transfer appears to be a major factor shifting the distribution of household resilience outward to the right.

[16] The distribution of households' resilience in each round are given in Figure A1 in the Appendix.

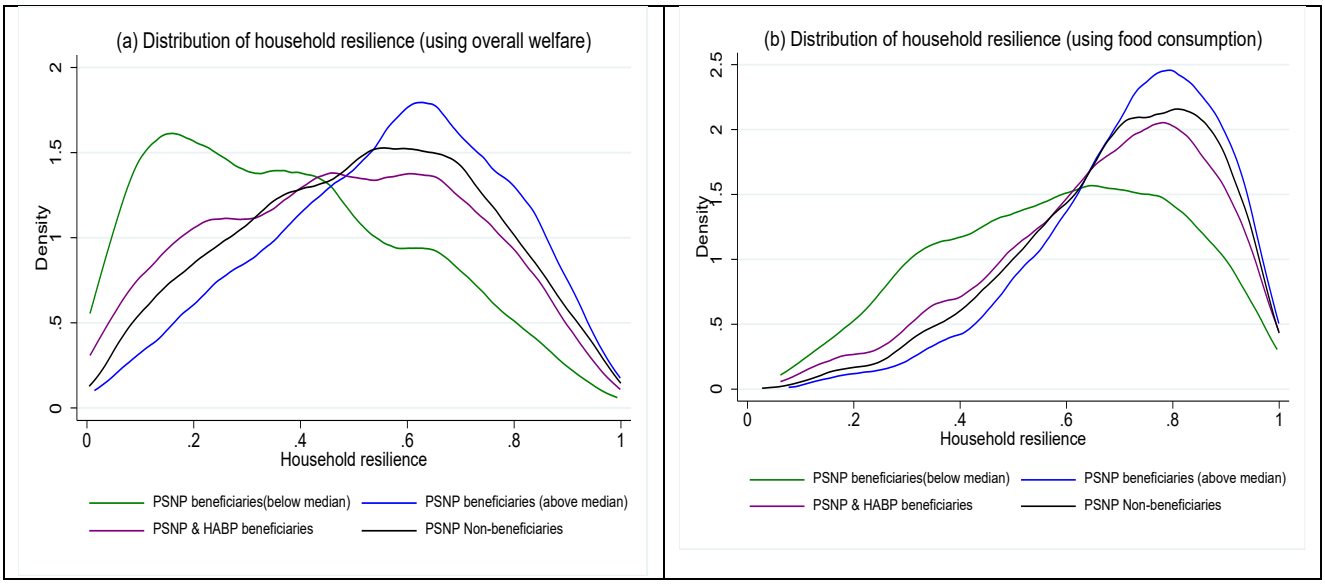

Figure 2: Distribution of household resilience across PSNP beneficiaries and non-beneficiaries

Table 4 provides results associated with the three steps and empirical specifications in Section 4, using overall consumption per adult equivalent as a measure of welfare. The first column results model households' welfare (consumption per adult equivalent) as a function of previous welfare and household and community characteristics as well as district (*woreda* in the context of Ethiopia) fixed effects. Besides, demographic and socioeconomic characteristics of households, we also control for community characteristics, including accessibility to urban centers, access to electricity and rainfall. The first column results in Table 4 show that household welfare exhibit significant persistence and increases with education of household head and asset (e.g., land, livestock and other productive assets) ownership. Most importantly, the last rows in Table 4 show that PSNP participant households exhibit lower welfare without any PSNP transfer, but additional PSNP transfers are positively associated with household welfare. This is intuitive because PSNP beneficiaries are generally poor. The positive association between the size of PSNP transfers and overall consumption is consistent with previous evaluations showing positive impact of PSNP on several proximate determinants of household welfare (e.g., Gilligan et al., 2009; Hoddinott et al., 2012; Berhane et al., 2014). An important and interesting question in this setting is: what is the amount of PSNP transfer needed to significantly improve the welfare of beneficiary households and make them better off than the non-beneficiaries? We can generate this threshold by combining the coefficients associated with PSNP participation and corresponding transfers using the expression in equation (1) as follows: $\frac{\partial W_{it}}{\partial PSNP_{it}} = \hat{\gamma}_m + \hat{\delta}_m PSNP\_Transfer_{it} + \hat{\varphi}_m HABP_{it}$. Using

the coefficients in column 1, we can identify a threshold PSNP transfer that can equate the welfare of PSNP beneficiaries and non-beneficiaries, which amounts to a value of 6.9 in log-transformed value, which is around the 95th percentile of the PSNP transfers.[17] Participation in HABP, either alone or as complement to PSNP, is not statistically associated with household welfare.

The second column results in Table 4 characterizes households' welfare dispersion (variance) as function of similar list of household and community characteristics as well as geographic fixed effects. These results show previous round welfare is associated with higher variability; better off households are likely to experience higher variability in welfare. Older households and less educated households are more likely to experience higher variability in welfare while higher value of livestock assets is associated with lower variability in welfare. Comparing the sign of some of the coefficients in column 1 and 2, we can easily see that some variables have varying implications on average welfare and variability in welfare, justifying joint modelling of these outcomes.

Using the estimates in columns 1 and 2 and assuming a lognormal distribution of welfare outcomes, we compute household and round-specific resilience measure, the probability that a household avoids falling below the poverty line. For each household, we use the conditional mean and conditional variance from column 1 and 2 to compute households' welfare probability density function for each round. Column 3 of Table 4 then characterizes the distribution of households' resilience across a longlist of household and community characteristics. Most importantly, the results in column 3 provide some interesting relationships between PSNP participation, transfers and households' resilience.

The results in column 3 of Table 4 provides several important insights. First, there exists an inertia effect as recent welfare standings of households significantly boosts households' resilience, as shown by the significant correlations between lagged welfare and resilience. This is intuitive as households' capacity to avoid falling into poverty is likely to accumulate with time. Second, while some of the observable characteristics of households and communities significantly associated with household welfare also matter for their resilience, there are some distinct patterns worth highlighting. Some household characteristics such as gender, age, marital status and occupation of household head appears to less relevant for household welfare while turning out to

[17] $\frac{\partial W_{it}}{\partial PSNP_{it}} = \hat{\gamma}_m + \hat{\delta}_m PSNP\_Transfer_{it} + \hat{\varphi}_m HABP_{it}$=0→ $\frac{\hat{\gamma}_m}{\hat{\delta}_m} = PSNP\_Transfer_{it}$. Note that $\hat{\varphi}_m$ is statistically indistinguishable from zero.

be significantly associated with households' resilience. Similarly, community characteristics such as access to electricity, distance to nearest town and rainfall appear to be insignificant in our welfare equation while turning out statistically relevant in households' resilience. Access to electricity and higher rainfall spells are associated with higher welfare while remoteness contributes to deterioration in households' resilience. This may suggest that building household resilience may require investments not only on households but also on community amenities and infrastructure. More interestingly, participation in HABP is not statistically associated with short-term welfare while participation in both PSNP and HABP is associated with higher resilience. These results clearly suggest that household welfare and resilience can be driven by different factors and this implies that interventions that generate improvements in household welfare may not necessarily improve households' resilience and vice versa. This justifies evaluating the potential of social protection programs and other interventions to improve short-term welfare outcomes as well as their potential to improve households' resilience.

Finally, the results in column 3 of Table 4 show the relationship between PSNP participation, PSNP transfers and household resilience. As expected, without any transfer PSNP beneficiaries exhibit relatively lower resilience than non-beneficiaries, but PSNP transfers contribute to improving household resilience. By combining the coefficients associated with PSNP participation and PSNP transfers we can identify the threshold level of PSNP transfers needed to lift the poor out of poverty or simply the level of investment in social protection needed to make PSNP beneficiaries as resilient as non-beneficiaries. For example, without HABP participation, the coefficients associated with PSNP participation and PSNP transfers show that transfers up until about 95th percentile of the PSNP transfers (which amounts 7.04 in log-transformed value) do not make PSNP households more resilient than non-beneficiaries. Participation in both HABP and PSNP is associated with higher resilience. These pieces of evidence provide two insights. First, although small safety net transfers and light interventions may improve household welfare, boosting household resilience and pulling the poor out of poverty may require much larger transfers than the average, implying significantly larger investments in social protection programs than is currently the case. This further reinforces the rationale to evaluate the potential of social protection programs to improve short-term welfare outcomes and longer-term resilience (and hence the capacity to avoid poverty). Second, combining safety nets with income generating or asset building initiatives may facilitate building poor households' resilience.

In Table 5 we probe the robustness of our main findings using food consumption expenditure as a measure of household welfare and using national food poverty line as a normative threshold. The results in Table 5 are consistent with those in Table 4 and hence confirm our main findings, including the implication of PSNP participation and PSNP transfers.

Table 4: PSNP transfers and households' resilience: using overall consumption and national poverty line

	(1) Log (food consumption per adult equivalence)	(2) Variance of log (food consumption per adult equivalence)	(3) Resilience
Lagged log(consumption per adult)	0.060***	0.037***	0.026***
	(0.013)	(0.014)	(0.001)
Male headed household	-0.031	-0.001	-0.013***
	(0.024)	(0.025)	(0.002)
Log (age of household head)	-0.031	0.039*	-0.017***
	(0.020)	(0.022)	(0.002)
Household head no education	-0.041**	0.040**	-0.023***
	(0.017)	(0.016)	(0.001)
Marital status (married)	-0.017	-0.017	-0.007***
	(0.018)	(0.021)	(0.002)
Household size	-0.065***	0.005	-0.035***
	(0.005)	(0.006)	(0.001)
Main occupation farming	-0.058**	-0.035	-0.031***
	(0.027)	(0.028)	(0.002)
Main occupation non-farming	0.034	-0.034	0.017***
	(0.049)	(0.047)	(0.003)
Log (land size)	0.071***	0.003	0.034***
	(0.014)	(0.014)	(0.002)
Log (value of livestock per adult)	0.058***	-0.027***	0.030***
	(0.007)	(0.007)	(0.001)
Log (value of productive assets per adult)	0.138***	-0.009	0.071***
	(0.011)	(0.011)	(0.001)
Household has access to electricity	0.036	-0.002	0.020***
	(0.034)	(0.024)	(0.003)
Log (distance to nearest town)	-0.028	0.009	-0.017***
	(0.017)	(0.012)	(0.001)
Lagged log (rainfall)	0.082	-0.024	0.020**
	(0.070)	(0.055)	(0.008)
PSNP household	-0.371***	0.072	-0.183***
	(0.089)	(0.075)	(0.009)
IHS (PNSP transfer per capita)	0.054***	-0.010	0.026***
	(0.015)	(0.012)	(0.001)
HABP participation	-0.024	-0.040*	-0.012***
	(0.020)	(0.021)	(0.002)
PSNP and HABP participation	0.022	-0.009	0.008***
	(0.025)	(0.029)	(0.002)
Constant	6.903***	0.330	-0.126**
	(0.504)	(0.397)	(0.055)
District fixed effects (78)	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
R-squared	0.332	0.042	0.959
No. observations	13337	13337	13337

Notes: Standard errors, clustered at village (enumeration area) level, are given in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. IHS stands for inverse hyperbolic sine transformation of PSNP transfers. By this transformation, PSNP non-beneficiaries assume a value of 0.

Table 5: PSNP transfers and households' resilience: using food consumption and national food poverty line

	(1) Log (food consumption per adult equivalence)	(2) Variance of log (food consumption per adult equivalence)	(3) Resilience
Lagged log (food consumption per adult)	0.046***	0.030	0.013***
	(0.012)	(0.021)	(0.001)
Male headed household	-0.018	-0.026	0.002
	(0.028)	(0.061)	(0.001)
Log (age of household head)	-0.017	0.044	-0.020***
	(0.025)	(0.053)	(0.002)
Household head no education	-0.023	0.012	-0.011***
	(0.020)	(0.037)	(0.001)
Marital status (married)	-0.008	-0.084*	0.011***
	(0.021)	(0.050)	(0.001)
Household size	-0.069***	0.004	-0.030***
	(0.006)	(0.009)	(0.001)
Main occupation farming	-0.067**	0.045	-0.037***
	(0.031)	(0.059)	(0.002)
Main occupation non-farm	-0.020	-0.066	0.002
	(0.053)	(0.060)	(0.003)
Log (farm size)	0.069***	0.002	0.027***
	(0.017)	(0.027)	(0.001)
Log (value of livestock per adult)	0.056***	-0.047**	0.030***
	(0.008)	(0.021)	(0.001)
Log (value of productive assets per adult)	0.113***	0.012	0.044***
	(0.013)	(0.017)	(0.001)
Household has access to electricity	0.021	0.043	0.001
	(0.037)	(0.036)	(0.002)
Log (distance to nearest town)	-0.026	0.011	-0.015***
	(0.017)	(0.015)	(0.001)
Lagged log (rainfall)	0.100	0.010	0.024***
	(0.079)	(0.080)	(0.006)
PSNP member household	-0.363***	-0.063	-0.153***
	(0.099)	(0.172)	(0.009)
IHS (PSNP transfer per capita)	0.053***	0.015	0.022***
	(0.016)	(0.032)	(0.001)
HABP participation	-0.034	-0.076**	-0.003*
	(0.024)	(0.037)	(0.001)
PSNP and HABP participation	0.028	-0.006	0.010***
	(0.029)	(0.057)	(0.002)
Constant	6.787***	0.378	0.234***
	(0.566)	(0.649)	(0.039)
District fixed effects (78)	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
R-squared	0.257	0.027	0.959
No. observations	13337	13337	13337

Notes: Standard errors, clustered at village (enumeration area) level, are given in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. IHS stands for inverse hyperbolic sine transformation of PSNP transfers. By this transformation, PSNP non-beneficiaries assume a value of 0.

6.2 PSNP Transfers and Household Resilience

In this section, we focus on the implication of PSNP transfers by restricting the sample to PSNP beneficiaries only. This serves several purposes. First, this circumvents selection into the PSNP program and ensures that we are analyzing a generally poor sample who have been exposed to varying intensity of program participation. Second, by abstracting from the extensive margin of participation, focusing on PSNP participant households, we can evaluate the implication of each additional increase in PSNP transfer on households' resilience. Such an investigation can also uncover potential nonlinearities in the effect of PSNP transfers. For all these purposes, we restrict the sample to those households beneficiating from the PSNP and re-estimate the three empirical specifications in equation (1)-(3).

Before describing the parametric estimation results, Figure 3 provides nonparametric relationships between PSNP transfers and household resilience. The first graph in Figure 3 shows the relationship between household resilience (constructed using overall consumption expenditure and national poverty line) and PSNP transfers while the second graph provides similar relationship using a resilience indicator computed using food consumption expenditure and national food poverty line. The first vertical axis (red) corresponds to the 25th percentile of PSNP transfers and the second vertical axis (black) corresponds median value of transfer. Both graphs clearly show that PSNP transfers can only generate significant boost in resilience if they are relatively large enough. PSNP transfers below about the median are less likely to generate meaningful improvements in resilience. In particular, the relationship between household resilience and PSNP transfers less than the 25th percentile is statistically insignificant. As shown in Table 1 PSNP transfers are generally very small with the mean and median transfer per capita amounting about 287 and 208 Ethiopian Birr, respectively. These results are consistent with the poverty transition patterns shown in Table 2 and the overall differences in the resilience of PSNP beneficiaries receiving below and above the median transfer. These results also corroborate recent findings by Balboni et al. (2021) that point out large transfers that create better jobs for the poor are effective in getting people out of poverty traps.

Table 6 provide parametric relationships between household resilience and PSNP transfers. The results in columns 1-3 are based on overall consumption and national poverty line while those results in columns 4-6 are based on food consumption and national food poverty line. The resilience measures in column 3 and 4 measure the probability that a household welfare does not fall below overall national poverty line or food poverty line. These results are broadly consistent

with the full sample results. We can clearly observe significant persistence in welfare and household resilience and most of the relationship between household welfare and observable characteristics of households and communities are intuitive. Larger PSNP transfers are associated with higher welfare and improved resilience.

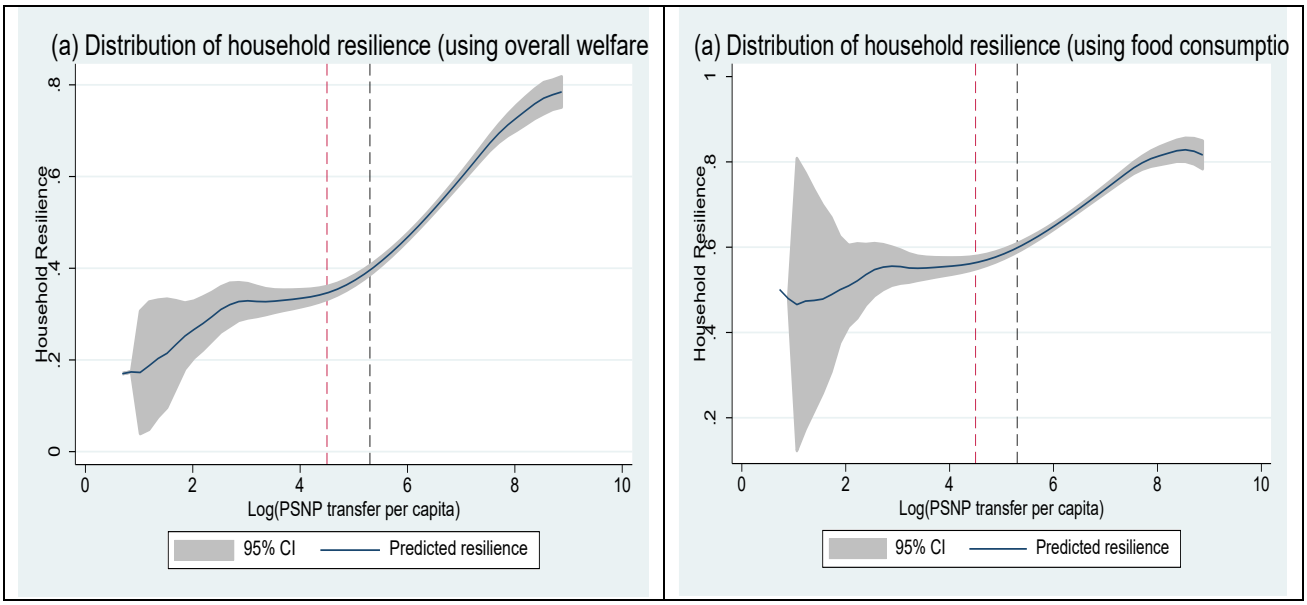

Figure 3: PSNP transfers and household resilience

Table 6: PSNP transfers and resilience of beneficiaries: intensive margin analysis

	Using overall consumption and poverty line			Using food consumption and food poverty line		
	(1) Log (consumption per adult)	(2) Variance of log (consumption per adult)	(3) Resilience	(4) Log (food consumption per adult)	(5) Variance of log (food consumption per adult)	(6) Resilience
Lagged log(consumption per adult)	0.050***	0.034**	0.023***	0.038**	0.030	0.011***
	(0.016)	(0.017)	(0.002)	(0.017)	(0.023)	(0.001)
Male headed household	-0.017	0.007	-0.009***	0.012	-0.071	0.021***
	(0.039)	(0.037)	(0.003)	(0.046)	(0.085)	(0.003)
Log (age of household head)	-0.059	0.082*	-0.027***	-0.048	0.184*	-0.052***
	(0.042)	(0.046)	(0.004)	(0.051)	(0.109)	(0.004)
Household head no education	-0.057*	-0.009	-0.029***	-0.036	-0.123	-0.000
	(0.029)	(0.030)	(0.002)	(0.035)	(0.115)	(0.002)
Marital status (married)	-0.036	-0.023	-0.017***	-0.038	-0.056	-0.007**
	(0.036)	(0.039)	(0.003)	(0.041)	(0.063)	(0.003)
Household size	-0.069***	-0.005	-0.036***	-0.073***	-0.002	-0.031***
	(0.008)	(0.007)	(0.001)	(0.008)	(0.013)	(0.001)
Main occupation farming	-0.081*	-0.024	-0.041***	-0.091*	0.049	-0.049***
	(0.046)	(0.036)	(0.003)	(0.053)	(0.095)	(0.003)
Main occupation non-farming	0.042	-0.038	0.021***	-0.001	-0.069	0.007
	(0.092)	(0.084)	(0.006)	(0.103)	(0.121)	(0.006)
Log (land size)	0.046**	-0.021	0.016***	0.045*	-0.010	0.017***
	(0.020)	(0.020)	(0.002)	(0.023)	(0.046)	(0.001)
Log (value of livestock per adult)	0.053***	-0.016	0.026***	0.054***	-0.072	0.031***
	(0.009)	(0.012)	(0.001)	(0.012)	(0.059)	(0.001)
Log (value of productive assets per adult)	0.129***	-0.025	0.064***	0.105***	0.017	0.039***
	(0.019)	(0.016)	(0.002)	(0.021)	(0.037)	(0.002)
Household has access to electricity	0.003	-0.007	0.003	-0.005	0.032	-0.007*
	(0.040)	(0.026)	(0.005)	(0.045)	(0.049)	(0.004)
Log (distance to nearest town)	-0.052***	0.010	-0.020***	-0.045**	0.012	-0.024***
	(0.017)	(0.012)	(0.003)	(0.020)	(0.019)	(0.002)
Lagged log (rainfall)	0.078	-0.069	0.039***	0.085	0.040	0.014
	(0.079)	(0.060)	(0.011)	(0.087)	(0.103)	(0.009)
IHS (PNSP transfer)	0.064***	0.017	0.036***	0.061**	0.074	0.019***
	(0.022)	(0.015)	(0.002)	(0.025)	(0.058)	(0.002)
Constant	6.881***	0.740	-0.367***	6.758***	-0.051	0.274***
	(0.621)	(0.513)	(0.066)	(0.672)	(0.909)	(0.062)
District fixed effects (78)	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.370	0.064	0.961	0.290	0.042	0.949
No. observations	3869	3869	3869	3869	3869	3869

Notes: Standard errors, clustered at village (enumeration area) level, are given in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. IHS stands for inverse hyperbolic sine transformation of PSNP transfers.

6.3 Duration of PSNP Participation and Household Resilience

In this section we examine whether the duration of PSNP participation is associated with resilience. For this purpose, we estimated the saturated specification in equation (4) by interacting past PSNP participation with current PSNP transfers. Resilience and hence households' capacity to avoid slipping into poverty is likely to accumulate over time, particularly in the absence of stressors and shocks. We anticipate that past PSNP participation can improve the effectiveness of current

transfers and hence their implication on households' resilience. Following the three steps in equation (1)-(3), we estimate and characterize mean and variance of household welfare as well as households' resilience, which is computed using the conditional mean and conditional variance of households' welfare. Figure 4 provides the distribution of household resilience across five groups of households: those receiving above median PSNP transfers in the current and last rounds (PSNP=1, lagged PSNP=1), those receiving below median PSNP transfers in the current and last rounds (PSNP=1, lagged PSNP=1), those receiving above median PSNP transfers in the current round but no transfers in the last round (PSNP=1, lagged PSNP=0), those receiving below median PSNP transfers in the current round but no transfers in the last round (PSNP=1, lagged PSNP=0), and those who have not received PSNP transfers in the current and last round (PSNP=0, lagged PSNP=0).

These density functions clearly show that the duration of PSNP participation is positively associated with higher resilience. Given the notion that resilience is related to longer-term capacity of households to satisfy normative thresholds, these results are intuitive. This implies that improving resilience may require longer-term and continuous investments in safety nets. Comparing the distribution of resilience across the five groups of households suggest that one-time PSNP participation is not sufficient to make PSNP beneficiaries more resilient than non-beneficiaries while consecutive years of participation in the program makes beneficiary households more resilient than non-beneficiary households.

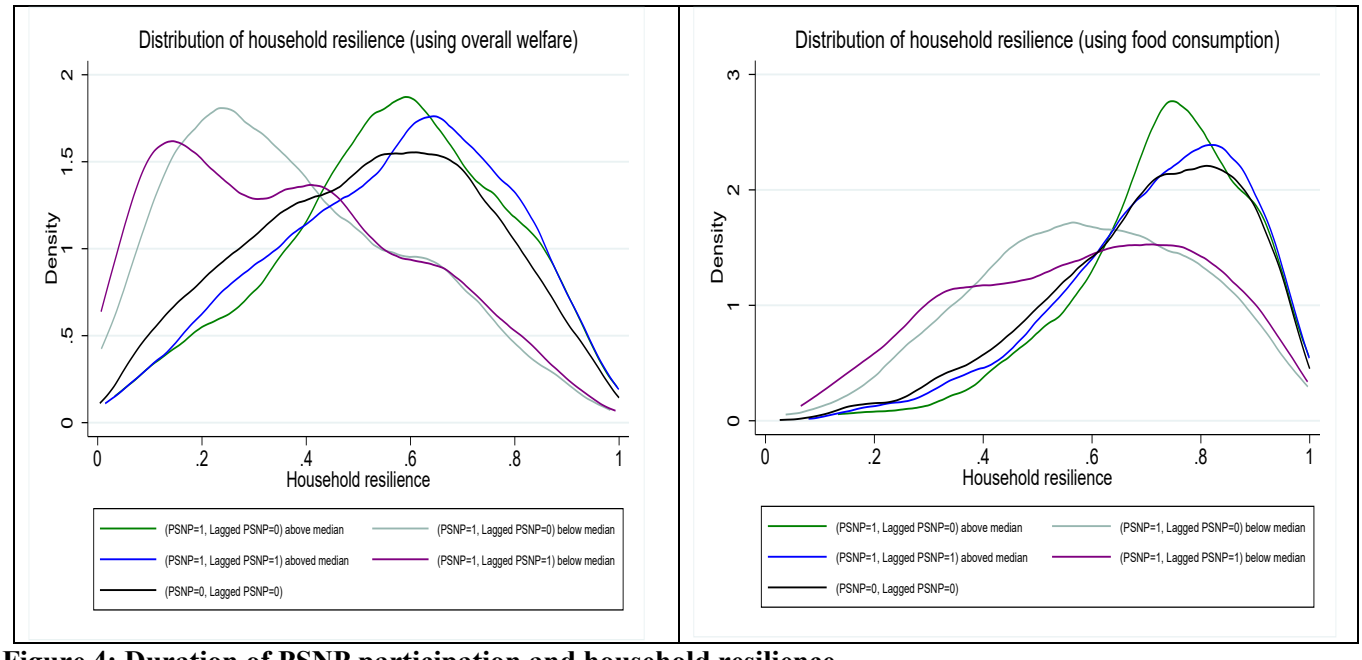

Figure 4: Duration of PSNP participation and household resilience

Table 7 presents parametric relationships between alternative extents of PSNP participation and households' welfare and resilience. Panel A provides results using total consumption as measure of welfare and overall national poverty line as a minimum normative threshold of living standard. Panel B provides results using food consumption as measure of welfare and national food poverty line as a measure of minimum threshold of living standard. Consistent with the main findings described in the previous subsections, the results in Table 7 indicate that additional PSNP transfers are associated with higher welfare and resilience. The main finding from Table 7 relates to the role of past PSNP participation in improving the effectiveness of current PSNP transfers. The interaction terms between lagged PSNP participation and PSNP transfers appear to be statistically significant in the welfare and resilience equations, implying that past participation in the program can boost the efficacy of current PSNP transfers.

Table 7: Persistence in PSNP participation and households' resilience

Panel A: welfare and resilience computed using overall consumption and national poverty line			
	(1) Log (consumption per adult)	(2) Variance of log(consumption per adult)	(3) Resilience
Lagged log(consumption per adult)	0.060***	0.038***	0.026***
	(0.013)	(0.014)	(0.001)
Lagged PSNP participation	-0.040	0.043	-0.019***
	(0.025)	(0.027)	(0.002)
PSNP participation (PSNP member household)	-0.350***	0.055	-0.173***
	(0.089)	(0.076)	(0.009)
IHS (PNSP transfer)	0.046***	-0.007	0.022***
	(0.015)	(0.013)	(0.002)
Lagged PSNP participation*IHS (PNSP transfer)	0.010*	-0.005	0.006***
	(0.006)	(0.006)	(0.000)
HABP participation	-0.024	-0.040*	-0.012***
	(0.020)	(0.022)	(0.002)
PSNP and HABP participation	0.023	-0.008	0.008***
	(0.025)	(0.029)	(0.002)
Household and community characteristics	Yes	Yes	Yes
District fixed effects (78)	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
R-squared	0.332	0.042	0.959
No. observations	13337	13337	13337
Panel B: welfare and resilience computed using food consumption and national food poverty line			
	(1) Log (food consumption per adult)	(2) Variance of log(food consumption per adult)	(3) Resilience
Lagged log(consumption per adult)	0.046***	0.031	0.013***
	(0.012)	(0.020)	(0.001)
Lagged PSNP participation	-0.035	0.084	-0.025***
	(0.029)	(0.065)	(0.002)
PSNP participation (PSNP member household)	-0.343***	-0.094	-0.140***
	(0.098)	(0.174)	(0.008)
IHS (PNSP transfer)	0.044***	0.018	0.017***
	(0.017)	(0.031)	(0.001)
Lagged PSNP participation*IHS (PNSP transfer)	0.012*	-0.007	0.006***
	(0.007)	(0.014)	(0.000)
HABP participation	-0.034	-0.078**	-0.002
	(0.024)	(0.037)	(0.001)
PSNP and HABP participation	0.030	-0.006	0.010***
	(0.029)	(0.056)	(0.002)
Household and community characteristics	Yes	Yes	Yes
District fixed effects (78)	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
R-squared	0.257	0.027	0.958
No. observations	13337	13337	13337

Notes: Standard errors, clustered at village (enumeration area) level, are given in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. IHS stands for inverse hyperbolic sine transformation of PSNP transfers. By this transformation, PSNP non-beneficiaries assume a value of 0.

7. Concluding Remarks

This paper examines the implication of a major social protection program, the Productive Safety Nets Program (PSNP) and its complementary programs in Ethiopia, on rural households' resilience. Following Cissé and Barrett (2018) we employ a probabilistic moment-based approach for measuring resilience and compute the probability that a household welfare satisfies minimum normative thresholds. We explore the resilience implications of program participation, as well as the level of transfers and duration of program participation. We also examine whether complementary income generating and asset building programs, mainly the Household Asset Building Program (HABP), generates additional improvements in resilience.

Our analyses highlight four important findings. First, we find that although PSNP transfers are positively associated with improved welfare, small safety net transfers are less likely to significantly improve household resilience. We find that PSNP transfers can only generate significant boost in resilience if they are large enough: in our study, transfers below the median are less likely to generate meaningful improvements in resilience. This suggests that although small safety net transfers and light interventions may improve household welfare, boosting household resilience or pulling the poor out of poverty may requires larger investments in social protection programs. However, empirical definition of threshold effects (how much is enough?) may vary considerably across contexts, and require further investigation to see whether generalizable recommendations may be made. Second, we find that continuous and persistent participation in the PSNP is associated with higher resilience. This implies that improving resilience may require long-term and continuous investments in safety nets. Third, complementary income generating and asset building initiatives such as HABP are associated with additional improvements in household resilience for those households participating in both PSNP and HABP. Fourth, our results point out that households' short-term welfare outcomes and resilience are likely to be driven by different factors and hence interventions that generate improvements in household welfare may not necessarily improve households' resilience and vice versa. For example, participation in HABP is associated with higher resilience while the implication of HABP on short-term welfare appears to be negligible. This justifies evaluating the potential of social protection programs and other interventions to improve short-term welfare outcomes as well as their potential to improve resilience.

Our findings have some design and targeting implications for social protection programs in Africa, where safety nets programs generally make quantitatively small transfers to beneficiaries

(e.g., Beegle et al., 2018). Although the effect of small-scale transfers can improve short-term welfare, interventions aiming to boost household resilience significantly and sustainably may need to identify critical thresholds in transfer amounts. This may be particularly important in contexts where the COVID-19 pandemic may have adversely affected the welfare and resilience of households. The suggestive evidence on the implication of combining safety nets with income generating or asset building initiatives to build poor households' resilience is also noteworthy for informing the design of safety net programs in Africa that usually aim to ultimately "graduate" safety net beneficiaries. In terms of targeting, those programs aiming to improve households' resilience and capacity to satisfy minimum living standard may consider pre-intervention resilience in their targeting of beneficiaries.

There are some important limitations to our analysis. Most notably, we lack exogenous variation in PSNP participation and hence our results can only provide suggestive evidence of potential impacts. We hope other researchers will complement these findings using plausibly exogenous variation in access to and amounts of safety net transfers.

References

Abay, K., G. Berhane, J. Hoddinott, T. Kibrom. 2021. "COVID-19 and Food Security in Ethiopia: Do Social Protection Programs Protect?" *Economic Development and Cultural Change.* https://doi.org/10.1086/715831

Andrews, C., A. Hsiao, and L. Ralston. 2018. "Social Safety Nets Promote Poverty Reduction, Increase Resilience, and Expand Opportunities." In K. Beegle,A. Coudouel, and E. Monsalve eds. *Realizing the Full Potential of Social Safety Nets in Africa.* Washington, D.C., The World Bank.

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

Balboni, C.A., Bandiera, O., Burgess, R., Ghatak, M. and A. Heil. 2021. Why do people stay poor? (No. w29340). National Bureau of Economic Research.

Banerjee, A., M. Faye, A. Krueger, P. Niehaus, and T. Suri. "Effects of a Universal Basic Income during the pandemic." Working Paper.

Barrett, C. B., and M. A. Constas. 2014. "Toward a theory of resilience for international development applications." *Proceedings of the National Academy of Sciences of the United States of America,* 111(40), 14625–14630.

Barrett, C. B., K. Ghezzi-kopel, J. Hoddinott, N. Homami, E. Tennant, J. Upton, and T. Wu. 2021. *A Scoping Review of the Development Resilience Literature: Theory, Methods and Evidence.* Applied Economics and Policy Working Paper Series NO. 2021-03. Cornell University.

Beegle, K., A. Coudouel, and E. Monsalve. 2018. "Realizing the Full Potential of Social Safety Nets in Africa." Washington D.C., The World Bank.

Berhane, G., J. Hoddinott, N. Kumar, A.S. Taffesse, M. T. Diressie, Y. Yohannes, R. Sabates-Wheeler, et al. 2011. "Evaluation of Ethiopia's Food Security Program: Documenting Progress in the Implementation of the Productive Safety Nets Programme and Household Asset Building Programme." Mimeo, International Food Policy Reserach Institute, Washington, DC.

Berhane, G., D.O. Gilligan, J. Hoddinott, N. Kumar, and A.S. Taffesse. 2014. "Can Social Protection Work in Africa? The Impact of Ethiopia's Productive Safety Net Programme." *Economic Development and Cultural Change,* 63(1): 1–26.

Berhane, G., J. Golan, K. Hirvonen, J. Hoddinott, S. Kim, A.S. Taffesse, K. Abay, T.W. Assefa, Y. Habte, M.H. Abay, …, and F. Yimer. 2020. *Evaluation of the nutrition-sensitive features of the fourth phase of Ethiopia's Productive Safety Net Programme.* ESSP working paper 140. Washington, DC: International Food Policy Research Institute (IFPRI).

Berhane, G., K. Hirvonen, and J. Hoddinott. 2016. *The Implementation of the Productive Safety Nets Programme, 2014. Highlands Outcomes Report 2015*. Addis Ababa: Ethiopia Strategy Support Program, International Food Policy Research Institute.

Berhane, G., K. Hirvonen, J. Hoddinott, N. Kumar, A. Seyoum Taffesse, Y. Yohannes, M. Tefera, B. Nishan, J. Lind, R. Sabates-Wheeler, and A. Strickland. 2016. *The Implementation of the Productive Safety Nets Programme and the Household Asset Building Programme in the Ethiopian Highlands, 2014. Program Performance Report 2015.* Addis Ababa: Ethiopia Strategy Support Program, International Food Policy Research Institute.

Berhane, G., S. Gidey, J. Hoddinott, N. Kumar, A. S. Taffesse, Y. Yohannes, J. Lind, M. Handino, K. Roelen, M. Tefera, and B. Nishan. 2013. *The Implementation of the Productive Safety Nets Programme and the Household Asset Building Programme in the Ethiopian Highlands, 2012. Program Performance Report.* Washington, DC: edited by International Food Policy Research Institute.

Béné, C. 2013. "Towards a quantifiable measure of resilience." *IDS Working Papers,* 2013(434), 1-27.

Béné, C., T. Frankenberger, and S. Nelson. 2015. *Design, monitoring and evaluation of resilience interventions: Conceptual and empirical considerations.* Institute of Development Studies Working Paper 459.

Birhanu, Z., A. Ambelu, N. Berhanu, A. Tesfaye, and K. Woldemichael. 2017. "Understanding Resilience Dimensions and Adaptive Strategies to the Impact of Recurrent Droughts in Borana Zone, Oromia Region, Ethiopia: A Grounded Theory Approach." *International Journal of Environmental Research and Public Health,* 14(2), 118.

Cissé, J. D., and C. B. Barrett. 2018. "Estimating development resilience: A conditional moments-based approach." *Journal of Development Economics*, 135, 272–284.

Coll-Black, S., D.O. Gilligan, J. Hoddinott, N. Kumar, and W. Wiseman. 2012. "10 Targeting Food Security Interventions in Ethiopia: The Productive Safety Net." *Food and Agriculture in Ethiopia: Progress and Policy Challenges,* 74: 280.

Constas, M., T. Frankenberger, and J. Hoddinott. 2014a. *Resilience measurement principles: Toward an agenda for measurement design.* Food Security Information Network, Resilience Measurement Technical Working Group, Technical Series, 1.

Constas, M., T. Frankenberger, J. Hoddinott, N. Mock, D. Romano, C. Béné, and D. Maxwell. 2014b. *A common analytical model for resilience measurement: Causal framework and methodological options.* Food Security Information Network Resilience Measurement Technical Working Group.

Devereux, S. and B. Guenther.2009. Agriculture and social protection in Ethiopia. Future Agricultures. Working Paper 008.

Doran, J., and B. Fingleton. 2016. "Employment resilience in Europe and the 2008 economic crisis: Insights from micro-level data." *Regional Studies,* 50, 644–656.

Folke, C. 2006. "Resilience: The emergence of a perspective for social–ecological systems analyses." *Global environmental change,* 16(3):253–267.

Filipski, M., G.A. Abegaz, T. Ferede, J.E. Taylor, X. Diao, and A.S. Taffesse. 2017. *General equilibrium impact assessment of the Productive Safety Net Program in Ethiopia.*3ie Impact Evaluation Report 66. New Delhi: International Initiative for Impact Evaluation (3ie).

GFDRE (Government of the Federal Democratic Republic of Ethiopia). 2004. *Productive Safety Net Programme: Programme Implementation Manual.* Addis Ababa: Ministry of Agriculture and Rural Development.

_____. 2009. Household Asset Building Programme, 2010–2014. Addis Ababa: Ministry of Agriculture and Rural Development.

———. 2010. *Productive Safety Net Programme: Programme Implementation Manual.* Addis Ababa: Ministry of Agriculture and Rural Development.

Gilligan, D. O., J. Hoddinott, and A. S. Taffesse. 2009. "The Impact of Ethiopia's Productive Safety Net Program and its Linkages." *The Journal of Development Studies* 45(10): 1684 -1706.

Gunderson, L. H. 2000. "Ecological Resilience—In Theory and Application." *Annual Review of Ecology and Systematics,* 31(1), 425–439.

Headey, D., and C. B. Barrett. 2015. "Opinion: Measuring development resilience in the world's poorest countries." *Proceedings of the National Academy of Sciences of the United States of America*, 112(37), 11423–11425. doi:10.1073/pnas.1512215112.

Hidrobo, M., J. Hoddinott, N. Kumar, and M. Olivier. 2018. "Social Protection, Food Security, and Asset Formation." *World Development* 101:88-103.

Hill, R., and E. Tsehaye. 2014. "Growth Safety Nets and Poverty: Assessing Progress in Ethiopia from 1996 to 2011". In *Ethiopia Poverty Assessment Report*, Background paper for the World Bank 2014. Washington, DC: World Bank.

Hoddinott, J. 2014. "Looking at development through a resilience lens." In *Chapter 3 of Resilience for food and nutrition security,* edited by P. Rajul, F. Shenggen, and S. Yosef, 19–26. Washington, D.C.: International Food Policy Research Institute (IFPRI).

Hoddinott, J., G. Berhane, D. O. Gilligan, N. Kumar, and A. S. Taffesse. 2012. "The Impact of Ethiopia's Productive Safety Net Programme and Related Transfers on Agricultural Productivity." *Journal of African Economies* 21 (5): 761–786.

Holling, C.S. 1973. "Resilience and stability of ecological systems." *Annual Review of Ecology and Systematics,* 4, 1-23.

Knippenberg, E., and J. Hoddinott. 2017. *Shocks, social protection, and resilience: Evidence from Ethiopia.* Ethiopia Strategy Support Program (ESSP) Working Paper 109. Addis Ababa: International Food Policy Research Institute.

Knippenberg, E., N. Jensen, and M. Constas. 2019. "Quantifying household resilience with high frequency data: Temporal dynamics and methodological options." *World Development,* 121, 1–15.

Martin, R., and P. Sunley. 2014. "On the notion of regional economic resilience: Conceptualization and explanation." *Journal of Economic Geography,* 15, 1–42.

Perrings, C. 2006. "Resilience and sustainable development." *Environment and Development Economics,* 11(4), 417-427.

Phadera, L., H. Michelson, A. Winter-Nelson, and P. Goldsmith. 2019. "Do asset transfers build household resilience?" *Journal of Development Economics,* 138, 205–227.

Pimm, S.L. 1984. "The complexity and stability of ecosystems." *Nature,* 307, 321-326.

Quandt, A., H. Neufeldt, and J. T. McCabe. 2019. "Building livelihood resilience: What role does agroforestry play?" *Climate and Development,* 11(6), 485–500.

Saxena, A., B. Guneralp, R. Bailis, G. Yohe, and C. Oliver. 2016. "Evaluating the resilience of forest dependent communities in Central India by combining the sustainable livelihoods framework and the cross scale resilience analysis." *Current Science* 110(7), 1195-1207.

Slater, R., and A. McCord 2013. "Learning from the PSNP: The Influence of Ethiopia's Social Protection Experience." In *Food Security, Safety Nets and Social Protection in Ethiopia, edited by* D. Rahmato, A. Pankhurst, and J.-G. van Uffelen. Addis Ababa: Forum for Social Studies.

Ulriksen, M. S. 2016. "Ideational and Institutional Drivers of Social Protection in Tanzania." WIDER Working Paper 2016/142, United Nations University– World Institute for Development Economics Research, Helsinki.

Upton, J. B., J. D. Cisse, and C. B. Barrett. 2016. "Food security as resilience: Reconciling definition and measurement." *Agricultural Economics* 47(s1), 135–147.

Vaitla, B., J. D. Cissé, J. Upton, G. Tesfay, N. Abadi, and D. Maxwell. 2020. "How the choice of food security indicators affects the assessment of resilience: an example from northern Ethiopia." *Food Security* 12 (1), 137-150.

Vollenweider, X. 2015. "Measuring climate resilience and vulnerability: A case study from Ethiopia." Final Report prepared for the Famine Early Warning Systems Network (FEWS NET) Technical Support Contract (TSC), Kimetrica LLC.

Walker, B., L. Gunderson, A. Kinzig, C. Folke, S. Carpenter, and L. Schultz. 2006. "A Handful of Heuristics and Some Propositions for Understanding Resilience in Social-Ecological Systems." *Ecology and Society* 11(1).

Woolf, S., J. Twigg, P. Parikh, A. Karaoglou, and T. Cheab. 2016. "Towards measurable resilience: A novel framework tool for the assessment of resilience levels in slums." *International Journal of Disaster Risk Reduction* 19, 280–302.

World Bank. 2004. "Productive Safety Net Program Project Appraisal Document." APL I November (Washington: World Bank).

World Bank. 2015. "Ethiopia Poverty Assessment 2014." World Bank. Washington, DC.

Appendix

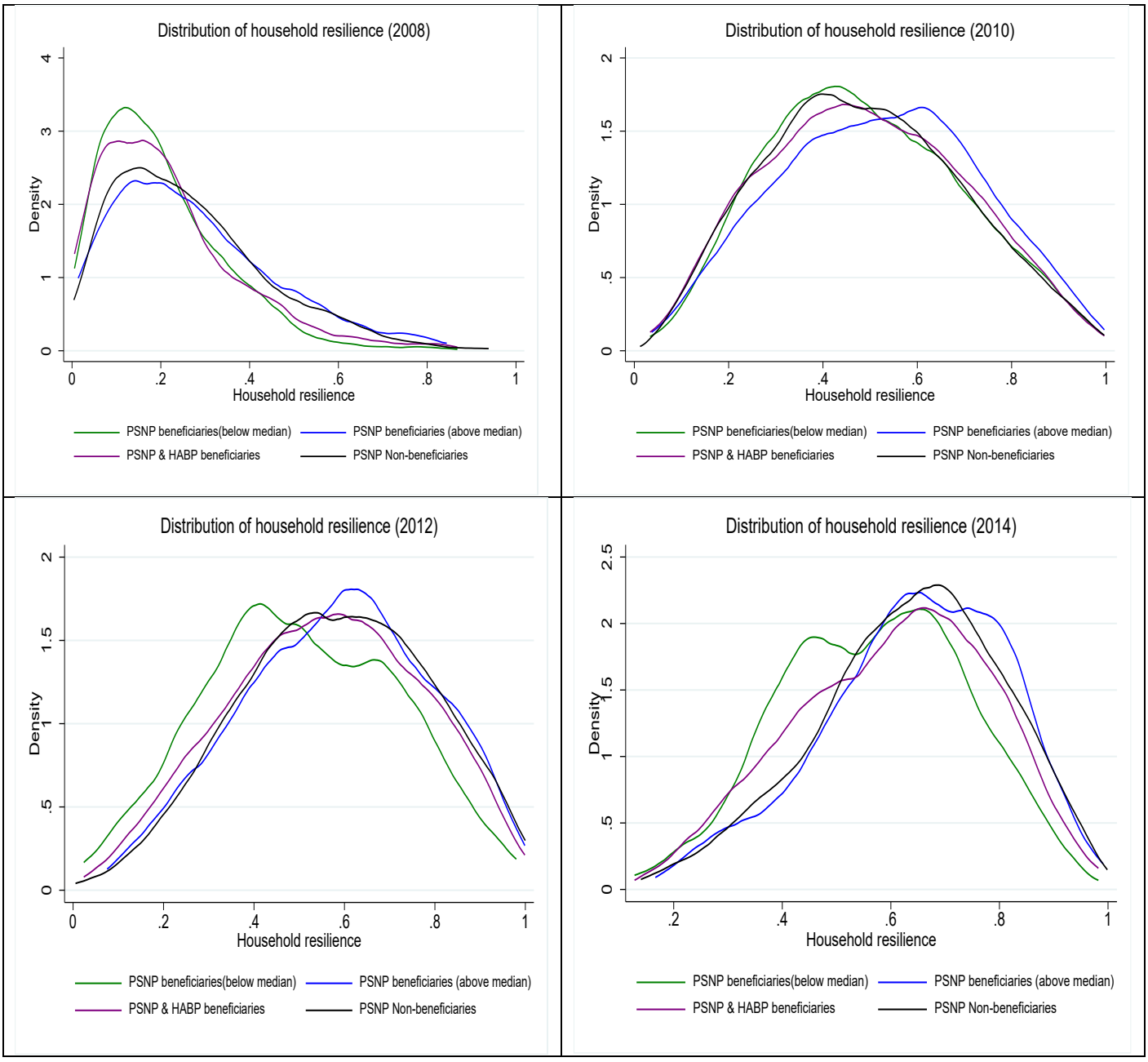

Figure A1: Distribution of household resilience across PSNP beneficiaries and non-beneficiaries

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