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Decentralization of Social Assistance Programs and the Poverty Reducing Impacts of Earnings Potential Equivalence Scales

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Abstract
Who receives aid and how much he or she receives are questions of central importance for any well-functioning social protection program. We investigate community-based processes for allocating aid within Ethiopia's Productive Safety Net Program. We document local governments' noncompliance with federal implementation mandates; instead of distributing aid via the federally mandated uniform per capita payment schedule, communities distribute aid based on locally determined equivalence scales. Rather than equalizing consumption, it appears that local communities allocate aid based on an earnings potential equivalence scale by assigning higher payments to cohorts that have lower wage earnings potential (e.g., teenage girls vs. teenage boys, adult women vs. adult men, elderly vs. working age adults). The decentralized implementation approach reduces head count poverty more than if communities followed central implementation mandates. However, poverty gap and poverty gap squared measures would be lower under central implementation mandates. The choice of distribution rules at the intensive margin does not materially affect poverty measures, suggesting that targeting efforts might be best focused on eligibility at the extensive margin.

Keywords: decentralization, equivalence scales, social protection, targeting, safety nets

1. Introduction

Social protection programs provide an important mechanism for delivering targeted aid to those in need. However, there is much debate concerning optimal design and implementation of these programs. This paper focuses on two critical aspects of design: Should programs be controlled from a central location, or should local communities decide for themselves how to distribute aid? Once participants are selected, should aid be equalized on a per capita basis, on an equivalent consumption basis, or should communities account for household earning potential and allocate more aid to households with lower earnings potential (or other community based objective)? Because aid budgets are limited, designing programs to optimize the poverty reducing impacts of existing resources is essential.

The debate over the optimal locus of program control begins with a discussion on the costs of acquiring the best information to target resources. Many argue that local governments should be able to acquire accurate and detailed information about the needs of a given household at lower costs than central governments and therefore tailor programs more effectively. Notable examples that support local control include: social assistance programs in Albania being better targeted due to local information (Alderman 2002), decentralization increasing the responsiveness of public investment to local needs in Bolivia (Faguet 2004), and pro-poor program benefits increasing with decentralization in Bangladesh (Galasso & Ravallion 2000; Galasso & Ravallion 2005). Additionally, a local government knows best what is politically and socially feasible in the local context (Pritchett 2005). Huther and Shah (1998) find positive correlations between decentralization and indices of

political participation, social development and an overall quality of government index in a broad study covering 80 countries.

However, despite these potential benefits, there is no guarantee that local governments are more accountable to their local constituents. Even if informational advantages exist for local governments, there may be high levels of political capture by local elites (Bardhan & Mookherjee 2000; Bardhan & Mookherjee 2005). Local rent seeking and the possibility that local preferences are not pro-poor are additional drawbacks (Conning & Kevane 2002). Furthermore, ethnically heterogeneous and sparsely populated areas can be prone to local corruption (Olken 2006). Furthermore, Besley and Coate (2003) argue that if local governments allocate public goods with positive spatial spillovers that fall outside their jurisdiction, the local government may not take into account the positive spillovers resulting in under-provision of public goods.

In addition to the question of centralized control, once participants are chosen, how should aid be allocated? Answering this question requires comparing welfare levels between different households of differing sizes and compositions and has been a central question in welfare economics for more than a century. A standard approach is for the social scientist to decide that some aspect of the household's demand decisions are indicative of its welfare, for example the food share of expenditures (Engel 1895) or the total expenditures on adult goods (Rothbarth 1943). These traditional consumption based equivalence scales infer the amount of additional expenditures required to compensate a household with a different demographic composition so that it has the same welfare as a reference household. As an alternative to traditional demand-based equivalence scales, Olken (2005) calculates a community equivalence scale based on the revealed preferences of how communities actually allocate aid. This removes the discretion of the social scientist in deciding what aspect of household demand is most indicative of welfare as it simply observes how communities make the inter-household comparisons of welfare for themselves.

In this paper we offer additional evidence on the debate around optimal program design. Specifically, we examine local versus central control in a large social protection program in Ethiopia. The Productive Safety Net Program (PSNP), has elements of both local and centralized control, and provides an excellent context to examine how program structure affects its stated poverty reduction goals. The PSNP is designed as a hybrid program with rules set by the federal government, but then implemented by local governments. In examining this hybrid program we use variance decomposition techniques to explore the degree of compliance with federal payment mandates. We find widespread noncompliance with the federal directive of uniform per capita payments.

Then we extend Olken's (2005) technique of calculating revealed community equivalence scales to the intensive margin (payment received) of program participation rather than just the extensive margin (whether or not a household is

included in the program). In doing so, we find that Ethiopian communities allocate aid such that children actually receive larger payments than adults. The current consensus for traditional consumption based equivalence scales is that an additional child requires about 40-50% of the cost of each of the first two adults (Deaton 1997). Olken (2005) finds Indonesian communities allocate aid as if adding an additional child requires expenditures equal to 76% of each of the first two adults. Our findings sharply contrast with both of these estimates.

We propose that Ethiopian communities equalize welfare among participant household through an earnings potential equivalence scale, rather than equivalent consumption. By this we mean that communities allocate aid as if equivalent welfare is based on how household attributes (age, gender, size, composition) relate to future household earnings potential, rather than how those attributes relate to household consumption.

Lastly, we calculate Foster, Greer, and Thorbecke's (FGT) (1984) poverty metric for the Ethiopian economy, comparing hypothetical scenarios of uniform benefit schedules as per the federal guidance, traditional consumption based equivalence scales, and the actual equivalence scales used by local communities. The decentralized implementation approach and earnings potential equivalence scales reduce head count poverty more than if communities followed central implementation mandates or used traditional consumption based equivalence scales. However, poverty gap and poverty gap squared measures are lower following the central implementation mandates and with traditional consumption based equivalence scales.

2. Background and design of the Productive Safety Net Program

More than 80% of Ethiopia's population lives in rural areas and relies on rain fed agriculture as its main source of livelihood. Historically, insufficient and variable rainfall caused cycles of food shortage and famine, and the government of Ethiopia requested international assistance when needed. In the early 2000s, the government and a consortium of international donors realized that Ethiopia's existing policy of issuing ad hoc emergency appeals had become an annual event and that Ethiopia's underlying issue was chronic food insecurity and not simply the acute food shortages caused by rainfall shocks. Therefore, the government of Ethiopia launched the Productive Safety Net Program in January 2005, with the stated objective "to provide transfers to the food insecure population in chronically food insecure areas in a way that prevents asset depletion at the household level and creates assets at the community level" (Ethiopian Ministry of Agriculture and Rural Development 2004).

The PSNP is designed to assist approximately 7 to 8 million people per year and has an approximate annual budget of USD$500 million. The program is administered through a system that includes all official administrative levels of the Ethiopian

government.[1] In 2005, 190 *woredas* were included in the PSNP in the four major highland regions of the country; since then the PSNP has expanded to 290 *woredas*, including pastoralist areas in Afar, Oromia, and Somali Region. The PSNP has two major parts: 1) a large public works (PW) program in which food insecure households provide daily labor to public works projects in exchange for food or cash, and 2) a smaller direct support (DS) component in which households without available labor (generally the elderly or disabled) receive a transfer with no work requirement.

The PSNP adheres to the principle of "primacy of transfers," which states that transfers continue regardless of operational issues in the public works programs which might prevent participants from receiving their full quota of work days (Ethiopian Ministry of Agriculture and Rural Development 2004). This feature has been noted as rare when compared to public works programs in other countries, but also has been hailed as a critical element from a social protection perspective in that it ensures reliable and predictable transfers (Lieuw-Kie-Song 2011). The principle of "primacy of transfers" also distinguishes the program from other large public works programs such as India's Mahatma Ghandi National Rural Employment Guarantee Scheme where rationing (participant seeks work, but is excluded from work) is high (Liu & Barrett 2013).

The PSNP program generally runs from January to June to avoid conflict with peak farming times in the second half of the year.[2] Participant households are entitled to Nx5 workdays per month, where N is the household headcount. This is known as full family targeting because each household member is entitled to receive the same level of payment. Based on the number of days of entitled work, the family will receive cash at the day labor rate, an equivalent amount of food aid, or a mixture of the two.[3] A direct support household receives a payout calculated in the same way without the work requirement; for example, a grandmother with four small children would receive the transfer payment equivalent to a family of five without any work requirement.

[1] The government's structure from most central to least central is: federal, region, zone, *woreda,* and *kebele.* A *woreda's* population generally ranges from 20,000 to 250,000, while a *kebele's* population generally ranges from 2,000 to 4,000 (Federal Democratic Republic of Ethiopia Population Census Commission 2008).

[2] Common public works projects range from infrastructure projects (feeder roads, bridges, school buildings, health posts) to natural resource and environmental management projects such as terracing, reforesting hillsides, or erosion prevention activities. The daily wage rage is approximately USD$0.75-1.00 per day.

[3] One of the government of Ethiopia's initial stated goals of the PSNP was to move away from food aid and towards cash payments as aid. However, some donors, particularly the United States, would only give their contribution to the PSNP in the form of food aid, so the *woredas* supported by US government resources are generally chosen to be the most remote and those with the least market access where food aid is perhaps a better option than cash transfers.

2.1 Targeting of program participants

A combined administrative and community targeting approach is used in the PSNP. The amount of aid allocated to each *woreda* is determined at the federal level (based on need and historic receipt of food aid). Then local targeting committees identify eligible households in each community (*kebele*). The Program Implementation Manual (PIM) mentions key criteria for participant selection including: household is a member of the community, household has faced continuous food shortages, and household has faced sudden serious, and/or household lacks adequate family support or other means of social protection. These criteria are broad and allow for significant local level discretion in determining who participates and who does not (Caeyers & Dercon 2012). Selected households are then assigned to public works or direct support depending on available labor. While this system allows variation as to which households are in or out of the PSNP (the extensive margin), the instructions in the PIM are explicit that a uniform payment per household member is required conditional on PSNP participation (the intensive margin).

3. Estimation strategy

The feature of full family targeting is of central importance for this study. The Program Implementation Manual (PIM) states: "If a household is identified as being chronically food insecure and eligible for the PSNP, all household members will be listed as clients of the program. That is, the transfer that a household receives each month will be calculated using the prevailing wage rate multiplied by all family members, regardless of their age, even if some family members are only infants" (Ethiopian Ministry of Agriculture and Rural Development 2010a). The prevailing wage rate for the PSNP public works program is set nationally by the central government and increases as consumer prices increase,[4] however the wage rate was uniform for all locations at any given date between 2005-2012.[5]

3.1. Construction of marginal payment variable

In any given year between 2005-2012 a uniform per capita benefit schedule was in place. The PSNP provides payments for six months of the year. For example, in 2009 the value of the annual PSNP payment was 300 ETB/person,[6] so a family of two should receive 600 ETB, a family of three 900 ETB, a family of four 1200 ETB, and so on. Therefore, conditional on household PSNP participation, there should be no variation in the marginal transfer of increasing household size by one.

To test if this is the case, we construct a marginal payment variable for an additional household member. This is the difference in payment a household actually received compared to the mean payment (conditional on being in the PSNP) in that same *woreda* for a household whose size is larger by one member. The probability density

[4] Wage rates were 6 Ethiopian birr (ETB)/day in 2005-2007, 8 ETB/day in 2008, 10 ETB/day in 2009-2010, 12 ETB/day in 2011 and 14 ETB/day in 2012 (Ahmed 2012; World Bank 2009).

[5] Starting in 2013 the wage rate was no longer uniform across the country, but began to vary by location based on local labor market conditions.

[6] The daily wage rate in 2009 was 10 ETB/day and the PSNP makes payments to beneficiaries for six months per year (10 ETB/day*5 days/month*6 months = 300 ETB/person/year).

function of the incremental differences in marginal payouts for additional HH members is the distribution of:

$$MP_{itw} = (\overline{T_{tw}} \mid H_{tw} = n+1) - (T_{itw} \mid H_{itw} = n) \quad (1)$$

Where $\overline{T_{tw}}$ is the mean transfer for households with size $H_{tw} = n + 1$ in year t and *woreda* w and T_{itw} is the amount of transfer for household i in year t and *woreda* w and $H_{itw} = n$ is household size for household i in year t and *woreda* w, and $n + 1 \cong N$ represents the different household sizes found in the sample.[7] We symmetrically trim the 1% of outliers from each tail of the marginal payment sample to reduce the effect of outliers.[8]

3.2. Decomposing the variance of marginal payment

We adapt the nonparametric variance decomposition approach of Barrett and Luseno (2004) to decompose the variance in marginal payments at differing levels of the government structure within the PSNP. Barrett and Luseno used this technique to locate the sources of producer price risk in livestock markets in northern Kenya, but it is easily adapted to understand how marginal payments vary at differing levels of government administration in the PSNP.

The decomposition works as follows. Let i index individual households, k is the *kebele* location, w is the *woreda* location, z is the zone location, r is the region location, and f is the federal level.[9] Simply begin with the obvious statement that marginal payment of a given household equals the marginal payment of that same household.

$$MP_{ikwzrf} = MP_{ikwzrf} \quad (2)$$

Then repeatedly add and subtract the same term to the right hand side of equation (2) and regroup with parentheses.

[7] This is a one-step-ahead estimator. We also construct a one-step-behind estimator (i.e. $MP_{itw} = (T_{itw}|H_{itw} = n) - (\overline{T_{tw}}|H_{tw} = n - 1)$. Results using the one-step-ahead estimator are presented in the main paper; results using the one-step-behind estimator do not materially change and are presented in Appendix A.

[8] We also calculate additional marginal payment measures using the *kebele* rather than the *woreda* as the reference point. The *kebele* is a lower administrative unit and calculating the marginal payment this way would be advantageous if the *kebele* is the locus of determination in marginal payments. It has the disadvantage, however, of data loss, as there are more boundary problems and more potential gaps in the data when creating the distribution of marginal payments. Additionally, the marginal payment variable is calculated with and without simple non-parametric smoothing to reduce the impact of any outliers in a given *woreda* or *kebele*. Irrespective of the way the marginal payment variable is generated, the variance decomposition results are largely the same. The additional marginal payment measures are presented as robustness checks in Appendix A.

[9] The decomposition is executed only on data points from the same year; therefore the year subscript is dropped in the model specification.

$$MP_{ikwzrf} = (MP_{ikwzrf} - \overline{MP_k}) + (\overline{MP_k} - \overline{MP_w}) + (\overline{MP_w} - \overline{MP_z}) + (\overline{MP_z} - \overline{MP_r}) + (\overline{MP_r} - \overline{MP_f}) + \overline{MP_f} \quad (3)$$

Equivalently this can be rewritten as:

$$MP_{ikwzrf} = K + W + Z + R + F + \overline{MP_f} \quad (4)$$

where $K \equiv (MP_{ikwzrf} - \overline{MP_k})$ is the deviation of household marginal payment from the *kebele* mean marginal payment in the same *kebele*; $W \equiv (\overline{MP_k} - \overline{MP_w})$ is the deviation of *kebele* mean marginal payment from *woreda* mean marginal payment in the same *woreda*; $Z \equiv (\overline{MP_w} - \overline{MP_z})$ is the deviation of *woreda* mean marginal payment from zonal mean marginal payment in the same zone; $R \equiv (\overline{MP_z} - \overline{MP_r})$ is the deviation of zonal mean marginal payment from regional mean marginal payment in the same region; and, lastly, $F \equiv (\overline{MP_r} - \overline{MP_f})$ is the deviation of regional mean marginal payment from federal mean marginal payment. Taking the variance of equation (4) gives the following decomposition:

$$\begin{aligned} Var(MP_{ikwzrf}) = {} & Var(K) + Var(W) + Var(Z) + Var(R) + Var(F) + \\ & 2[Cov(K,W) + Cov(K,Z) + Cov(K,R) + Cov(K,F) + Cov(W,Z) + \\ & Covs(W,R) + Cov(W,F) + Cov(Z,R) + Cov(Z,F) + Cov(R,F)] \end{aligned} \quad (5)$$

Simplification and splitting the covariance shares equally between the two components leads to the following five sources of variation in marginal payments:

$$KS \equiv Var(K) + Cov(K,W) + Cov(K,Z) + Cov(K,R) + Cov(K,F) \quad (6)$$

is the *kebele* source variation,

$$WS \equiv Var(W) + Cov(K,W) + Cov(W,Z) + Cov(W,R) + Cov(W,F) \quad (7)$$

is the *woreda* source variation,

$$ZS \equiv Var(Z) + Cov(K,Z) + Cov(W,Z) + Cov(Z,R) + Cov(Z,F) \quad (8)$$

is the zonal source variation,

$$RS \equiv Var(R) + Cov(K,R) + Cov(W,R) + Cov(Z,R) + Cov(R,F) \quad (9)$$

is the regional source variation, and

$$FS \equiv Var(F) + Cov(K,F) + Cov(W,F) + Cov(Z,F) + Cov(R,F) \quad (10)$$

is the federal source variation. Substituting these five variables into equation (5) and dividing both sides by $Var(MP_{ikwzrf})$ gives a decomposition of the sources of variation of marginal payment:

$$1 = ks + ws + zs + rs + fs \tag{11}$$

where the lower case variables are shares of variation from each source.

3.3. Estimating revealed community equivalence scales

As the size of a household expands, so do its consumption needs. However, due to fixed costs in running a household, consumption needs generally do not expand proportionally for each additional household member. This concept is of central importance when making welfare comparisons between households of differing sizes and demographic composition, or in calibrating household benefit transfers in social programs.

One way to address this challenge is to calculate an equivalence scale. An equivalence scale is a measure of the cost of living for a household of a given size and demographic composition, relative to the cost of living of a reference household, holding utility or standard of living constant (Deaton 1997; Lewbel & Pendakur 2008; OECD 2008; Browning et al. 2013). To recover revealed community equivalence scales in the PSNP, we adapt the technique used by Olken (2005) in examining the allocations made by communities in a decentralized emergency relief program in Indonesia.

The conceptual setup of Olken's model is as follows. Each household's indirect utility function, as evaluated by the community is:

$$v(y, n, k, x, p, a) \tag{12}$$

where y represents total household expenditures (not including aid receipts), n represents total number of people in the household, k represents the number of children in the household, x represents other household characteristics, p represents a vector of prices, and a represents the amount of aid received by the household. Assume that v is concave in y. Assume the community maximizes a social welfare function:

$$\max \sum_{i=1}^{I} \beta(y_i, n_i, k_i, x_i, p) v(y_i, n_i, k_i, x_i, p, a_i) \qquad \text{s.t.} \sum_{i=1}^{I} a_i = A \tag{13}$$

where β represents welfare weights on each household, I is the total number of households in the community, and A represents total amount of aid to be distributed. There are important distinctions between β and v. For example, many aspects of a household's welfare might affect the community's decisions such as

vulnerability of children to shocks or increased medical expenditures for the sick. These are captured in v. However, it is possible that other factors besides pure welfare maximization affect a village's decision of how to allocate aid. For example, the political connectedness of a household or a desire to provide social insurance to those suffering a recent unexpected shock even if their marginal utility of receiving the aid was lower than another statistically poorer household. These are captured by β. Because the weights of β may also be related to household composition (through n or k) we are unable to separately identify the community welfare weights β and the indirect utility function v in this context (Olken 2005). We can, however, identify the product of the two (called the overall community benefit function), which is denoted:

$$B(y_i, n_i, k_i, x_i, p, a_i) = \beta(y_i, n_i, k_i, x_i, p) v(y_i, n_i, k_i, x_i, p, a_i) \tag{14}$$

After doing so the community maximization problem becomes:

$$\max_{a_i} \sum_{i=1}^{I} B(y_i, n_i, k_i, x_i, p, a_i) \qquad \text{s.t.} \sum_{i=1}^{I} a_i = A \tag{15}$$

To differentiate the cost of children relative to adults and introduce household economies of scale, we parameterize these effects following Deaton (1997) and Olken (2005). For a given set of prices, let α be the cost of children relative to adults, so that each child costs as much as α adults. Define total number of effective adults to be $(n-(1-\alpha)k)^{\theta}$, where θ captures household economies of scale. As θ increases from 0, economies of scale within the household decline, constant returns to scale in household size (as the federal uniform benefit schedule of the PSNP suggests) corresponds to $\theta = 1$. Rewrite B so that it depends on household composition only through the effect of household composition on household expenditure per effective adult (Olken 2005). Expenditure per equivalent adult is defined as:

$$\tilde{y} = \frac{y}{(n-(1-\alpha)k)^{\theta}} \tag{16}$$

and then rewrite B so that it depends on n and k, only through $\tilde{y}$:

$$B(\tilde{y}, x_i, a_i) \tag{17}$$

Following Olken (2005) assume that prices are held constant and remove the price vector p from the community benefit function.[10] There are two key assumptions

[10] In the estimation strategy constant spatiotemporal prices are captured in the year-*kebele* fixed effects. As implemented, this assumes that communities assume that all households within the community face the same prices in a given location and time.

concerning the function B. First, assume B is concave in income per equivalent adult $\tilde{y}$. Second, assume that:

$$\frac{\partial^2 B}{\partial \tilde{y} \partial a_i} < 0 \tag{18}$$

meaning that conditional on all other household characteristics x, the marginal utility of aid is higher for households with lower effective consumption (i.e., the marginal utility of aid is higher for the poor).

Based on the community benefit function and the two assumptions presented, conditional on household characteristics x, the households with the lowest consumption per equivalent adult will receive aid. In theory, this means there is a threshold where all the households above the threshold do not receive aid and all the households below the threshold do receive aid. This threshold will vary by community based on how much aid the community has to distribute, A, the distribution of household utilities in the community, and how strong is the community's preference for targeting aid among the very poor, captured by the magnitude of $(\partial^2 B/\partial \tilde{y} \partial a_i)$.

Next introduce an error term into the model, and the probability that a household receives aid is equal to the probability that a household's consumption per effective adult, as evaluated by the community equivalence scales, is lower than some threshold. This threshold varies by community, so it can be modeled as a binary choice model with community fixed effects. This is equivalent to an equation in the form:

$$\Pr(Receive\_aid_{ij}) = F\left[\gamma_j + \gamma_2 B\left(\frac{y_{ij}}{(n_{ij} - (1-\alpha)k_{ij})^{\theta}}, x_{ij}\right)\right] \tag{19}$$

Where γ_j is the community fixed effect that captures different thresholds in each community and F is the distribution function for the error term.

3.4. Empirical specification of revealed community equivalence scales

Empirical estimation of the community benefit function (19) requires a functional form for B and the distribution of the error term F. Following Olken we use the log indirect utility function. Therefore the probability a household i in community j receives aid is:

$$\Pr(Receive\_aid_{ij}) = F\left[\gamma_j + \gamma_2 \log(y_{ij}) - \gamma_2 \theta \log(n_{ij} - (1-\alpha)k_{ij}) + \gamma_3 x_{ij}\right] \tag{20}$$

Because this is nonlinear, we estimate a linear approximation:[11]

$$\Pr(Receive\_aid_{ij}) = F\left[\gamma_j + \gamma_2 \log(y_{ij}) - \gamma_2\theta \log(n_{ij}) + \gamma_2\theta(1-\alpha)\left(\frac{k_{ij}}{n_{ij}}\right) + \gamma_3 x_{ij}\right] \quad (21)$$

In the empirical work this can be extended to include different child age categories to separately estimate equivalence scales for different groupings of children. To do that, include the percentage of household members in each child age grouping rather than just the overall percentage of children. A further extension includes the gender of those children to examine if community preferences in distributing aid are gender neutral or if there exists a sex bias.

Following Olken, we assume that the error term takes the logistic form, which allows us to use the conditional fixed-effects logit model. Rewriting equation (21) to incorporate this functional form requires additional notation. Let r_{ij} be a binary dependent variable equal to 1 if household i in village j received PSNP aid, and 0 otherwise. Let N_j be the number of households in village j and T_j be the number of households in village j that received PSNP aid. Denote d_{ij} to be a dummy variable equal to 1 if household i in village j received PSNP aid or 0 if the household did not receive aid, and denote by S_j the set of all possible vectors $d_j = \{d_{1j}, \ldots, d_{Nj}\}$ such that $\sum_{i=1}^{N_j} d_{ij} = T_j$. Define $\lambda_1 \equiv \gamma_2$, $\lambda_2 \equiv -\gamma_2\theta$, $\lambda_3 \equiv \gamma_2\theta(1-\alpha)$, and $\lambda_4 \equiv \gamma_3$. Substituting the logistic CDF for F in equation (21) and conditioning out the fixed effects yields an empirical specification of the form:

$$\Pr\left(r_{ij} = 1 \mid \sum_{i=1}^{N_j} y_{ij} = T_j\right) = \frac{\exp\left[\sum_{i=1}^{N_j} y_{ij}\left(\lambda_1 \log(y_{ij}) + \lambda_2 \log(n_{ij}) + \lambda_3\left(\frac{k_{ij}}{n_{ij}}\right) + \lambda_4 x_{ij}\right)\right]}{\sum_{d_j \in S_j} \exp\left[\sum_{i=1}^{N_j} d_{ij}\left(\lambda_1 \log(y_{ij}) + \lambda_2 \log(n_{ij}) + \lambda_3\left(\frac{k_{ij}}{n_{ij}}\right) + \lambda_4 x_{ij}\right)\right]} \quad (22)$$

Equation (22) is estimated with maximum likelihood. Then using the estimated coefficients λ_1, λ_2, and λ_3 we recover estimates of θ and α. To compute the revealed community equivalence scale, which is the ratio of the income of the household with a given composition to that of a reference household, set the welfare levels for the reference and comparison household equal, and solve. As per Olken (2005) define a reference household with income y^R, size n^R, and number of children k^R, and comparison household with income y^C, size n^C, and number of children k^C. Setting equation (21) for the reference and comparison households equal yields:

[11] This is similar to the Working-Leser (Working 1943; Leser 1963) functional form used by Deaton and Muellbauer (1986).

$$\lambda_1 \log\left(\frac{y_{ij}^C}{y_{ij}^R}\right) = \lambda_3\left(\frac{k_{ij}^R}{n_{ij}^R} - \frac{k_{ij}^C}{n_{ij}^C}\right) - \lambda_2 \log\left(\frac{n_{ij}^C}{n_{ij}^R}\right) \quad (23)$$

Dividing the right hand side by λ_1 and taking exponents yields the equivalence scales. In this model, the equivalence scale is independent of the income of the reference household (Olken 2005). This equivalence scale estimation method focuses on the extensive margin of participation of the aid program, for example, a statement like "to maintain the same probability of receiving aid after adding a child to a household of two adults requires an increase in expenditures of XX%." This technique, however, does not analyze how payment amounts vary once a household is selected into the aid program (i.e., the intensive margin of participation).

The data Olken uses only covers one point in time (as it is an emergency relief program), while the PSNP data are a panel structure where the community selects households in or out of the PSNP repeatedly over time. To extend the Olken (2005) method to multi-year data, we use the conditional fixed-effects logit model as well, but instead of conditioning out community level fixed effects, we condition out community-year fixed effects. This assumes, however, that the parameter coefficients are the same for a given community over time (i.e., $\lambda_1, \lambda_2, \lambda_3, \lambda_4$ do not change over time).

3.5. Empirical approach to calculating the intensive margin of participation

After estimating how household demographic structure affects selection into the PSNP (extensive margin of participation), we consider the question of whether household demographic structure affects the levels of payments once a family is included in the PSNP (intensive margin of participation). Because households that receive PSNP payments are not randomly selected, a selection model with censoring at zero is necessary to estimate the value of parameters associated with household demographic structure and the intensive margin of participation.

Deciding on an appropriate selection model, however, raises an ancillary but important question; do rural Ethiopian communities make decisions about the extensive and intensive margins of participation in the PSNP sequentially or simultaneously? Based on the project implementation manual, we would expect a sequential two-stage process where households are initially chosen for inclusion to the PSNP and then households receive the federally mandated fixed per capita payments in the second stage. However, this may not always be the case. For example, what happens if the community receives less than the required amount to fully fund all qualified participants in the community? Does the community reduce the number of beneficiary households and keep per capita payments at federally mandated rates, or keep as many household in the program as possible and reduce the amount of per capita payments, or simultaneously decide what households are included in the PSNP and how much payment they receive? In a constrained setting like this, it is conceivable that communities could make decisions about the

extensive and intensive margins of PSNP participation either sequentially or simultaneously.

To account for this possibility, we adapt the technique proposed by Bellemare and Barrett (2006) and model payment levels at the intensive margin both sequentially and simultaneously and then use a sequential J-test (Davidson & MacKinnon 1993) to see which is better supported by the data. The sequential model uses the results from (22) as the first stage of a two-stage selection model. We capture the predicted probability of PSNP participation, then convert that predicted probability to an inverse Mill's ratio (IMR) and include the IMR as a variable in a pooled OLS regression with *kebele*-year fixed effects in the second stage. The inverse Mill's ratio is calculated as:

$$\lambda_{itk} = \frac{\phi(\hat{r}_{itk})}{\Phi(\hat{r}_{itk})} \tag{24}$$

where $\phi(\hat{r}_{itk})$ is the probability distribution function, and $\Phi(\hat{r}_{itk})$ is the cumulative distribution function of $\hat{r}_{itk}$, the predicted probability of PSNP participation from (22).[12] The second stage is a pooled OLS modeled as:

$$P_{itk} = \alpha + Family\_Structure_{itk}{}'\beta + X_{itk}{}'\gamma + K_{tk} + \theta\lambda_{itk} + \varepsilon_{itk} \tag{25}$$

where P_{itk} is the payment to household i at year t at *kebele* k and $Family\_Structure_{itk}$ is a vector of household characteristics such as number of household members in age categories (ages 0-6, 7-15, 16-60, and 61+) and X_{itk} is a vector of household characteristics that might affect payments such as annual expenditures, gender and age of household head, marital status, education level, asset holdings (livestock, productive equipment), local political connectedness, and household level shocks. K_{tk} is the *kebele*-year fixed effect, λ_{itk} is the inverse Mills ratio converted from the predicted probability of PSNP participation from the first stage equation, and ε_{itk} is the error. To account for the non-negative censoring of P_{itk} the λ_{itk} term serves as an estimate of the (otherwise) omitted variable of the probability of selection into the PSNP (similar to Heckman 1979). The variables for local political participation are excluded from the second stage, the coefficients on these variables is statistically significant in the first stage, but if included they are not significant in the second stage. In essence, this means that local political participation can help a household enter the PSNP, but once in the PSNP, local political connections do not alter payment amounts made to households. The vector β is interpreted as the additional payout per household holding all else constant for one additional person in each of the age categories, it assumes that each person within a given age bracket is assigned the same value for β. The vector γ is interpreted as the additional household payment holding all else constant for an

[12] Note the additional t subscript in $\hat{r}_{itk}$ to denote time since our predicted probabilities come from equation (22) after it is taken to the multi-year extension.

additional unit of each household characteristic, and θ is the coefficient on the inverse Mills ratio.

To model the decision of selection into the PSNP and beneficiary payment amount as a simultaneous choice we use a standard tobit model in the form:

$$P_{itk} = \begin{cases} P_{itk}^{*} & if \quad P_{itk}^{*} > 0 \\ 0 & if \quad P_{itk}^{*} \leq 0 \end{cases} \tag{26}$$

where P_{itk}^{*} is the latent variable:

$$P_{itk}^{*} = \alpha + Family\_Structure_{itk}{}'\eta + X_{itk}{}'\psi + K_{tk} + \varepsilon_{itk} \tag{27}$$

Where P_{itk}^{*} is the latent variable of payment to household *I* at year *t* at *kebele k* and $Family\_Structure_{itk}$ and X_{itk} are vectors of household characteristics as above, K_{tk} is the *kebele*-year fixed effect, and μ_{itk} is the error. We use a J-test (Davidson & MacKinnon 1993) to test which model better fits the data statistically.

3.6. Simulating poverty reduction impacts of implementation modalities

After estimating equivalence scales at the intensive margin, we examine if the way in which local communities allocate aid is more or less poverty reducing than the uniform benefit schedule prescribed by the federal government. To do this, we must recover the budget constraint for each *woreda*. Unfortunately, we do not have records of the actual resources transferred from the federal level to the *woreda* government to implement the PSNP, however we can construct an estimate of the budget constraint faced by each *woreda* by using administrative planning records for the PSNP caseload per *woreda* (Ethiopian Ministry of Agriculture and Rural Development 2010b). By multiplying the planned caseload by the per capita payment observed in each *woreda*, we generate an estimate of the budget constraint faced in any *woreda*. Since surveyed participants were selected randomly from the roster of beneficiaries the average per capita payment received should be equivalent to the average per capita payment across the *woreda*. While not perfect, this measure should approximate the budget constraint faced by each *woreda*.

In cases where the local community receives less than the full budget amount necessary to implement the program in line with the PIM requirements (for example in 2009-10 this was 300 ETB/person), the community has a few options:

A. Reduce the number of beneficiaries, but keep uniformly high payment per beneficiary
B. Keep full number of beneficiaries, but reduce amount of payment per beneficiary
C. Some combination of these two options

Therefore we calculate the Foster, Greer, and Thorbecke (1984) metric of poverty within an economy under each of these options to understand how the actual allocation decisions at the local level affect poverty levels. The FGT metric is calculated as follows:

$$FGT_{\alpha} = \frac{1}{N}\sum_{i=1}^{H}\left(\frac{z - y_i}{z}\right)^{\alpha} \tag{28}$$

where z is a specified poverty line, N is the total number of people in the economy, H is the number of poor (those at or below the poverty line), y_i is individual income (or, expenditures) and α is a sensitivity parameter. As α increases from zero the individuals farther away from the poverty line are given more weight in calculating the measure. A higher FGT metric is associated with more poverty in the economy. For FGT calculations expenditures (y_i) includes the amount of aid (a_i) received if households received aid.

In cases where the federal government does not provide enough funds for the *woreda* to implement the full caseload at the full per person payment amount, we generate the FGT metric based on the three cases previously laid out. For option (A) give beneficiaries with the highest predicted probability of PSNP inclusion from (22) a full payment amount until the budget is exhausted. For option (B) give the quantity of households listed in the planning document the same per capita payment, but the payment amount is diluted so that the entire *woreda* budget is exhausted. Option (C) is modeled to mimic what is actually reflected in the data. Furthermore, we compare the equivalence scale implemented in practice with traditional consumption based equivalence scales (Deaton 1997) and with estimates from the revealed community equivalence scales in Indonesia (Olken 2005). We calculate an FGT metric for all options and examine which reduces poverty more in the economy.

4. Data and Descriptive Statistics

The data are from the Ethiopian Food Security Survey (EFSS), a panel survey collected every two years in the four largest regions of Ethiopia (Amhara, Tigray, Oromia, and Southern Nations and Nationalities People's Region (SNNPR)). The Central Statistical Agency (CSA) of Ethiopia and the International Food Policy Research Institute (IFPRI) collect the data. The dataset focuses on PSNP implementation areas and comprises 3,689 households in 2006, after which it expanded to 4,654 households in 2008 and beyond. The surveys take place in the traditional "hungry" season (June-August), which immediately precedes harvest time (September-October).

Within each region, food insecure *woredas* proportional to the number of food insecure *woredas* in all four regions were sampled. *Woredas* were selected with probability proportional to size based on the estimated population of the chronically

food insecure population.[13] In the 2006 round, 68 out of 190 *woredas* were selected for sampling. In 2008 and subsequent rounds this number increased to 79 total *woredas*. The sample includes both participant and non-participant households within selected PSNP *woredas*, however the sample was not originally designed to include non-PSNP *woredas* (though two of the *woredas* added in 2008 are non-PSNP *woredas*).[14]

Within *woredas*, enumeration areas (EAs) where the PSNP was active were identified. Then two EAs per *woreda* were chosen using probability proportional to size for Amhara, Oromia and SNNPR, three EAs were chosen per *woreda* in Tigray. Twenty-five households were interviewed in each EA; fifteen of these were randomly selected from the PNSP beneficiary list, while ten were randomly selected from non-beneficiary lists. For the 2006 survey round this resulted in approximately 900 households each in Tigray and Amhara, and 950 households each in Oromia and SNNPR. An EA corresponds to a *kebele*; there are 192 *kebeles* represented in the data.

USAID's additional financial support allowed more than 900 households to be included in the survey in 2008 and subsequent rounds. Starting in 2008, these additional households[15] were given the same questionnaire as the rest of the sample. In subsequent rounds, the same households were re-surveyed regardless of whether they had joined or left the PSNP.

The survey occurred in June-August of a given year and asked households about their PSNP payments for the previous 17 months,[16] leaving a gap of 7 months with no data every other year. Therefore, the analysis of payments at the extensive and intensive margins uses a yearly panel starting in 2006 with the total January-May PSNP payments as the key dependent variable.[17] The recall data of monthly household aid receipts is likely accurate as households were asked to produce their PSNP client card during the interview. The client card lists months and payments received (see sample client card in Figure 1).

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[13] The sampling methodology is based on Gilligan, Hoddinott, and Taffesse (2009) and Gilligan et al. (2007), which can be referenced for a more detailed analysis.

[14] The data from non-PSNP *woredas* drops out of estimation equations since there is no variation on the extensive margin, nor any payment data to analyze on the intensive margin.

[15] For the analysis in this paper as in Berhane et al. (2011) the additional USAID supported households are treated as a different region called Amhara-HVFB. HVFB stands for high value food basket as these households always received a grain, cooking oil and lentils or peas (protein source) according to USAID procedures of providing a full food basket in food distribution projects. Food baskets in other areas generally consisted only of a staple grain. The monetary value of the food received is calculated for each food transfer and this common metric is used in calculations across regions to ensure comparability.

[16] The 2006 survey only recounted PSNP payment data for 12 of the 18 months since the program start date at the beginning of 2005.

[17] PSNP work is designed to occur between January-June (avoiding the primary agricultural season July-December) so the January-May data covers almost all of the scheduled PSNP payments. However, it is noted that arrears in payments occurred in some years (Berhane et al. 2011).

4.1 Descriptive Statistics

Table 1 presents the basic descriptive statistics of the variables used in the analysis that follows.[18] The average non-participant household has about 20% higher expenditures than a PSNP household (12,458 ETB vs. 10,407 ETB).[19] A PSNP household is much more likely to be female headed (25.7% vs. 16.8%), less educated (1.20 vs. 1.06 years completed), and slightly smaller in size (5.31 vs. 5.15). PSNP households have about one third of a hectare lower land holdings (1.43 vs. 1.13), fewer livestock (4.88 vs. 3.30 tropical livestock units), and a lower value of productive equipment (270 ETB vs. 244 ETB). PSNP households have more direct (12.9% vs. 9.5%) and extended (21.7% vs. 18.8%) local political connections than non-participants. Concerning shocks, PSNP participants are more likely to have experienced the death of a spouse (2.5% vs. 1.7%) but the likelihood of facing a drought or illness shock is not statistically different between the groups. PSNP households have fewer working age adults (46.2% vs. 47.9%) and more elderly (7.9% vs. 6.2%), there is no statistical difference in the demographic composition of older children (24.9% vs. 24.6%) or young children (21.1% vs. 21.2%). According to these statistics, the hypothetical average PSNP family would have 5.15 members and therefore be entitled to an annual payout[20] of 1,545 ETB (5.15 people * 300 ETB/person/year), which is approximately 15% of annual household expenditures.

5. Results

5.1 Variance decomposition of marginal payment

The federally mandated uniform benefit schedule implies zero variance across the sample because the marginal payment is uniform in a given year (180 ETB/person in 2006-07, 240 ETB/person in 2008 and 300 ETB/person in 2009).[21] However, the variance decomposition (Table 2) shows that the largest share of variance in marginal payment is concentrated at the *kebele* (ks) level (ranging from 61.6% to 79.8%), followed by *woreda* (ws) (ranging from 16.7% to 35.6%), zonal (zs) source variation (ranging from 1.4% to 2.4%), regional (rs) source variation (ranging from 0.5% to 1.3%), and the federal (fs) level (ranging from 0.3% to 2.3%). In short, local governments account for most of the variation in marginal PSNP payments. Results are robust to the method in which the marginal payment variable is calculated (see Appendix Table A1).

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[18] Expenditures and value of productive assets have been adjusted to be in 2009 currency units using consumer price index data for Ethiopia downloaded from the World Bank, at http://data.worldbank.org/indicator/FP.CPI.TOTL

[19] Expenditures do not include PSNP payments received by households.

[20] Because the PSNP payment rate changes throughout the dataset, PSNP payment amounts are normalized to 2009 payment levels. For example this adjustment makes a 65% payment in 2007 (117 ETB when the pay schedule is 180ETB/year) equal to a 65% payment in 2009 (195 ETB when the pay schedule is 300ETB/year).

[21] Recall the daily wage rage in 2006-07 was 6 ETB/day (6 ETB/day*5 days/month*6 months = 180 ETB/person/year), 2008 wages were 8 ETB/day (8 ETB/day*5 days/month* 6 months = 240 ETB/person/year) and in 2009 was 10 ETB/day (10 ETB/day*5 days/month*6 months = 300 ETB/person/year).

It appears that the actual payment schedule is largely determined in a decentralized manner and does not follow the uniform payment schedule as stipulated by the federal government. This raises the important question: if the uniform payment structure is being violated and instead local levels of government determine payments, what factors determine actual benefit schedules, and what implications does this have for the effectiveness of the PSNP as a poverty reduction tool?

5.2 Revealed community equivalence scales at the extensive margin of participation

To examine how local governments allocate aid, we look at the extensive margin of participation. Estimated odds ratios of the extensive margin of participation are presented in Table 3 (logistic regression results are presented in Appendix Table A2). The specifications are run with (col. 2 and 4) and without household controls (col. 1 and 3). However, since household control variables are likely taken into account when communities decide which households to include in the program, the preferred specification is with household controls. With respect to household composition, larger households are associated with a higher probability of inclusion into the program. However, when examining the age structure of households (col. 2), the probability of inclusion in the PSNP is not different between age cohorts, meaning communities treat all people as equivalent when assigning PSNP status. When examining gender differences on the extensive margin (col. 4), there is no sex bias; boys and girls are treated equally. However, households with more adult men are less likely to be selected into the PSNP than households with more adult women. Households with higher expenditures are less likely to be included in the PSNP; households with a marital status of only one spouse (single, divorced, widowed) have higher probabilities of inclusion than married couples (the omitted category). Local political connectedness is associated with a higher probability of inclusion in the program while higher asset holdings (land, livestock) are associated with lower probabilities of program inclusion. Suffering a household shock neither increases nor decreases the probability of inclusion.

These results are different than those found in a similarly structured program in Indonesia. Olken (2005) finds that Indonesian communities allocate aid as if adding an additional child requires an increase of expenditures equal to only 76% of that spent on each of the first two adults. Our results suggest that, unlike in Indonesia, all people are treated as equivalent in determining household aid eligibility. The one exception to that rule, the fact that having more working age men reduces the likelihood of PSNP participation in spite of working age men's relatively greater consumption requirements is the first signal that a different set of 'equivalence scales' might be at play.

5.3 Intensive margin of participation

The intensive margin of participation can be modeled as either a sequential process, with households selected into the PSNP in one stage, and then payment amounts to the household decided at another stage, or as a simultaneous choice of both inclusion into the PSNP and payment amount decided at the same time.

The results for the simultaneous model (tobit) are presented in Table 4. The specifications are run with (col. 2 and 4) and without household control variables (col. 1 and 3). The preferred specification is with household controls. A child aged 0-6 (col. 2) receives an estimated 15% more than an adult aged 16-60 (95.2 ETB vs. 83.1 ETB) but this difference is not statistically significantly different than zero. Older children aged 7-15 receive 27% more ($p<0.05$) than adults (105.4 ETB vs. 83.1 ETB). The elderly receive 41% more than working aged adults (116.8 ETB vs. 83.1 ETB), however this difference is not statistically significant than zero (likely because of a very small sample size of elderly).

When allowing for gender differences (col. 4), girls and boys aged 0-6 receive about the same payment (89.9 ETB vs. 95.0 ETB), girls aged 7-15 receive 34% more ($p<0.05$) than boys the same age (120.4 ETB vs. 90.1 ETB). Adult working aged women are paid 74% more ($p<0.01$) than working aged men (109.5 ETB vs. 62.8 ETB). Elderly women receive 64% more than elderly men (143.7 ETB vs. 87.7 ETB) but this difference is not statistically significantly different than zero (likely because a small sample size of elderly). Further evidence of the earnings potential equivalence scale is that adult working aged men (those most likely to be able to find work in the marketplace) have the smallest coefficient estimate (62.8 ETB) of any age gender grouping. The coefficient on adult working aged men is statistically significantly smaller than the coefficient estimate of all other age and gender categories at $p<0.05$, with the exception of young boys aged 0-6 (significantly different at $p<0.10$) and elderly men (not significantly different).

The sequential model results (Table 5) are less conclusive, though some specifications still suggest that younger age cohorts are paid more than adults. Without accounting for any control variables (remember the PIM state that once selected into the program all participants should receive the same payment), younger children aged 0-6 (col. 1) receive about the same as children aged 7-15 (81.7 ETB vs. 77.8 ETB) and this is about 9% larger than what working aged adults receive (74.7 ETB). However, none of these differences are statistically significantly different than zero. Elderly receive a lower payment (54.5 ETB), which is marginally statistically different than children aged 0-6 ($p<0.10$), but not statistically significantly different than other age groups. When including controls (col. 2), young children receive the same as working aged adults (59.0 ETB vs. 60.2 ETB), but older children receive 12% more than working aged adults (67.6 ETB vs. 60.2 ETB), but this is not statistically significant either. Elderly receive 55.7 ETB, which is not statistically significantly different than any other group. When splitting age cohorts by gender (col. 4) there are no statistically significant differences between sexes within the same age cohort, nor are their statistically significant differences across any of the age and gender groups.

The J-test (Davidson & MacKinnon 1993) is inconclusive in determining which selection model (sequential or simultaneous) is preferred in the data. We obtain the predicted values for the sequential (2 step) model and include them as regressors in the simultaneous (tobit) model. We obtain the predicted values for the simultaneous

(tobit) model and include them as regressors in the sequential (2 step) model. The null hypotheses are: (1) the estimated coefficient for the predicted value of the sequential model is not statistically significantly different than zero in the simultaneous model and (2) the estimated coefficient for the predicted value of the simultaneous model is not statistically significantly different than zero in the sequential model. These test, respectively, that (1) the sequential model has no explanatory power with respect to the simultaneous model, and (2) the simultaneous model has no explanatory power with respect to the sequential model. The coefficient for (1) is 5.72 with a t-statistic of 9.24 ($p<0.000$), and the coefficient for (2) is -0.48 with a t-statistic of -4.39 ($p<0.000$). Because the coefficients under each of the null hypotheses are statistically significantly different than zero, we fail to reject that either model has power over the other model as the correct model.

5.4 Comparing poverty levels using Foster, Greer, Thorbecke (1984) poverty metric

Figure 2 shows that local communities face serious constraints to implement the PSNP with full uniform payments as prescribed by the PIM. Using administrative planning documents and the average per capita payout in each *woreda*, we calculate the share of budget received compared to the amount necessary to implement the program in full. The average community only received 62% the full amount required to implement the program as per the *woreda* planning documents (Ethiopian Ministry of Agriculture and Rural Development 2010b); 89% of communities (69 out of 78 *woredas* in our data) fall below a ratio of one while 11% received more than necessary to implement the program as designed in the PIM. Because the vast majority of communities have less funding than required to distribute the full per capita benefit to each household, they must choose how to distribute limited aid amounts.

When examining how communities respond to receiving less than the necessary budget to implement full per capita payments, communities could reduce the number of households that receive aid and give the full uniform payment per person (300 ETB/person in 2009-10) to fewer households, they could dilute per capita payments but still make payments to all selected households, or some combination of the two. We simulate various scenarios of community aid distribution in Table 6. The first row presents a counterfactual of what poverty levels would look like without the PSNP by examining expenditure data less PSNP payments. Because of a very low propensity to invest PSNP proceeds in productive assets (Gilligan et al. 2009; Hoddinott et al. 2012) it is unlikely that PSNP proceeds created a return for households outside of its consumption value, therefore simply subtracting the PSNP proceeds from household expenditures seems a feasible counterfactual of what poverty levels in communities were absent the program. The headcount poverty is 58.8% in this counterfactual scenario.

The second row of Table 6 presents the scenario of choosing selected PSNP households at random, giving those households the full uniform per capita payment and then stopping payments once the *woreda's* budget constraint is reached. In the

uniform payment scenario the FGT metrics are 0.5723, 0.2017, and 0.0950 for alphas of 0,1,2 respectively.

The third row depicts a diluted scenario where an equal, but diluted per capita payment is given to all selected PSNP households in a given *woreda* based on that *woreda's* budget constraint. In that scenario the FGT metrics are 0.5719, 0.2026, and .0955 for alphas of 0,1,2 respectively. The final row presents the PSNP per its actual implementation; the FGT metrics are 0.5705, 0.2025, and 0.0957 for alphas 0,1,2 respectively. The head count poverty (α=0) is lowest in the actual implementation scenario, but this difference is not statistically significantly different than the other scenarios due to large standard errors. The poverty gap (α=1) and the squared poverty gap (α=2) metrics are very similar between the simulated policies, they are lowest in the uniform payment scenario but the differences between policies are not statistically significantly different from zero.

Additionally, we are interested in the resultant poverty levels when the local communities use different equivalence scales. Specifically, we are interested if the earnings potential equivalence scale we observe in the Ethiopian data is more or less poverty reducing than traditional consumption based equivalence scales. In Table 7 we simulate communities using different equivalence scales to issue PSNP payments up to the *woreda* budget constraint. The first row shows the poverty levels of the counterfactual (same as above) 0.5879, 0.2181, and 0.1077 for α=0, α=1, α=2, respectively. Implementing the program with the OECD equivalence scale (row 2, first adult receives weight of 1.0, all other adults receive weight of 0.7 and all children receive weight of 0.5) results in FGT metrics of 0.5705, 0.2012, and 0.0951 for α=0, α=1, α=2, respectively. Implementing the program with the OECD modified equivalence scale (row 3, first adult receives weight of 1.0, all other adults receive weight of 0.5, and all children receive weight of 0.3) results in 0.5689, 0.2013, and 0.0952 for α=0, α=1, α=2, respectively. The rule of thumb (Deaton 1997) equivalence scales (row 4, each of the first two adults receives weight of 1.0, additional adults receive weight of 0.5, young children receive weight of 0.4, and older children receive weight of 0.5) produce FGT metrics of 0.5710, 0.2012, and 0.0950 for α=0, α=1, α=2, respectively. Finally, the fifth row presents the poverty metrics under actual implementation (the earnings potential equivalence scale), the FGT metrics are 0.5705, 0.2025, and 0.0789 for α=0, α=1, α=2, respectively. The poverty metrics for all equivalence scales are very similar, and none are statistically significantly different from each other.

6. Conclusion

We document clear noncompliance with federal implementation mandates of uniform per-capita benefit payments within the PSNP. The lowest level of governmental administration, the *kebele*, is associated with approximately 70-75% of the variance in marginal payments. Instead of distributing aid on an equal per capita basis it appears that communities distribute aid according to an earnings potential equivalence scale where some measure of future earnings potential is taken into account rather than current period consumption. In contrast to

traditional consumption based equivalence scales, the revealed community equivalence scales provide higher payments for children compared to adults, teenage girls compared to teenage boys, and adult women compared to adult men.

When examining how decentralized implementation compares to the federal implementation plan, we find that head count poverty is lower under decentralized implementation, but that poverty gap and poverty gap squared measures are lower under the centralized uniform per capita payment mandates (though given our sample size these differences are not statistically significant). When comparing the earnings potential equivalence scale with traditional consumption based equivalence scales, all have similar FGT metrics.

Because the use of a particular equivalence scale does not change poverty metrics, this implies that perhaps donors and implementers should be more focused on targeting at the extensive margin (which households get selected into the program) rather that how communities allocate aid among program participants (the intensive margin). Our results are suggestive that the decentralized approach may allow local communities to target aid to reduce the poverty of those closest to the poverty line rather than focusing aid on those in deeper poverty (thus reducing head count poverty, but not the metrics of deeper poverty). However, it is also possible that communities take a longer view of poverty as they distribute aid according to future earnings potential and a metric like the FGT, which only captures expenditures in the current period, does not adequately mimic the deeper dynamic concept of poverty as in the minds of Ethiopian communities.

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Table 1
Descriptive Statistics

	PSNP Status		
	Non-Participant	Participant	Difference
Total household expenditures, birr/year	12457.9	10406.8	2051.1***
	(8093.8)	(7247.2)	(125.3)
Age of household head	46.18	46.77	-0.589*
	(14.87)	(15.05)	(0.243)
Female headed household	0.168	0.257	-0.0895***
	(0.374)	(0.437)	(0.00660)
Household head highest grade attained	1.200	1.062	0.139***
	(2.299)	(2.145)	(0.0362)
Household size	5.312	5.147	0.164***
	(2.111)	(2.151)	(0.0347)
Percent children aged 0-6	0.212	0.211	0.00183
	(0.188)	(0.187)	(0.00305)
Percent children aged 7-15	0.246	0.249	-0.00283
	(0.188)	(0.193)	(0.00310)
Percent adults aged 16-60	0.479	0.462	0.0175***
	(0.210)	(0.217)	(0.00347)
Percent adults aged 61+	0.0622	0.0787	-0.0165***
	(0.159)	(0.191)	(0.00285)
Landholdings in hectares	1.430	1.158	0.272***
	(1.258)	(1.002)	(0.0186)
Livestock in tropical livestock units	4.897	3.298	1.599***
	(5.474)	(3.550)	(0.0757)
Household member has position in *kebele*	0.0953	0.129	-0.0340***
	(0.294)	(0.336)	(0.00512)
Friend or relative has position in *kebele*	0.188	0.217	-0.0282***
	(0.391)	(0.412)	(0.00653)
Value of productive equipment, birr	269.9	244.2	25.68***
	(319.3)	(309.0)	(5.118)
Drought mentioned as most important shock	0.492	0.494	-0.00242
	(0.500)	(0.500)	(0.00814)
Death of a spouse	0.0169	0.0248	-0.00792***
	(0.129)	(0.156)	(0.00232)
Crops suffered from illness of household member	0.102	0.104	-0.00271
	(0.302)	(0.306)	(0.00495)
Observations	7,867	7,250	

Note: Data is pooled from 2006-2009. Variables measured in currency are adjusted according to consumer price index and are listed in 2009 equivalent currency units. Household expenditures do not include payments from PSNP program. Household expenditures and value of productive equipment have the top and bottom 1% of observations removed. The mean and standard deviation by participant status is presented in the first two columns, the difference between non-participants and participants and standard error is presented in the third column. Difference between non-participants and participants significant at *** p<0.01, ** p<0.05, * p<0.1

Table 2

Decomposition of Source Variation in Marginal Payments: Productive Safety Net Program (PSNP)

	***kebele* source (ks)**	***woreda* source (ws)**	**zonal source (zs)**	**regional source (rs)**	**federal source (fs)**	**sample size (N)**
Source variation in marginal payments, 2006	0.7976	0.1667	0.0208	0.0125	0.0023	1560
Source variation in marginal payments, 2007	0.7148	0.2304	0.0238	0.0084	0.0226	2065
Source variation in marginal payments, 2008	0.7336	0.2389	0.0139	0.0048	0.0087	2091
Source variation in marginal payments, 2009	0.6162	0.3562	0.0190	0.0052	0.0033	1938
Average Source Variation	**0.7156**	**0.2480**	**0.0194**	**0.0077**	**0.0092**	**1914**

Note: Calculations based on PSNP payouts found in the Ethiopian Food Security Survey, the sample includes all payments to households for the five month period (Jan.-May) each year and removes outliers (the top 1% and bottom 1% of marginal payments). Marginal payments calculated using a step ahead estimator with *woreda* as the reference point.

Table 3

Extensive Margin of PSNP participation (2006-2009), logistic regression results presented as odds ratios

	(1) FE logit	(2) FE logit	(3) FE logit	(4) FE logit
Log annual household expenditures	0.41***	0.51***	0.41***	0.51***
	(0.03)	(0.03)	(0.03)	(0.03)
Log household size	1.22*	2.30***	1.27**	2.36***
	(0.13)	(0.27)	(0.13)	(0.28)
Percent children aged 0-6	1.06	0.63		
	(0.27)	(0.21)		
Percent children aged 7-15	1.29	0.82		
	(0.32)	(0.25)		
Percent adults aged 16-60	0.73*	0.72		
	(0.13)	(0.16)		
Percent boys aged 0-6			0.89	0.58
			(0.26)	(0.21)
Percent girls aged 0-6			1.12	0.61
			(0.33)	(0.21)
Percent boys aged 7-15			1.00	0.69
			(0.27)	(0.24)
Percent girls aged 7-15			1.48	0.87
			(0.40)	(0.29)
Percent men aged 16-60			0.55***	0.58**
			(0.12)	(0.16)
Percent women aged 16-60			0.93	0.85
			(0.19)	(0.21)
Household head highest grade attained		1.00		1.00
		(0.00)		(0.00)
Marital Status: Single		1.99***		1.99***
		(0.51)		(0.50)
Marital Status: Divorced		2.08***		2.07***
		(0.36)		(0.36)
Marital Status: Widowed		1.82***		1.81***
		(0.20)		(0.20)
Household member has position in *kebele*		1.95***		1.95***
		(0.21)		(0.21)
Friend or relative has position in *kebele*		1.38***		1.39***
		(0.11)		(0.11)
Landholdings in hectares		0.88***		0.87***
		(0.03)		(0.03)
Livestock in tropical livestock units		0.85***		0.85***
		(0.02)		(0.02)
Value of productive equipment (100's birr)		0.99		0.99
		(0.01)		(0.01)
Drought mentioned as most important shock		1.02		1.02
		(0.08)		(0.08)
Death of a spouse		1.20		1.20
		(0.21)		(0.21)
Crops suffered from illness of household member		1.04		1.04
		(0.09)		(0.09)
Kebele-year fixed effects	Yes	Yes	Yes	Yes
Observations	15,548	13,645	15,548	13,645
Chi-square test	224.5	294.1	237.8	320.3
Prob > chi^2	0.000	0.000	0.000	0.000
Pseudo R^2	0.041	0.101	0.042	0.101

Standard errors clustered at *kebele* level, presented in exponentiated form

*** p<0.01, ** p<0.05, * p<0.1

Note: The data is pooled from Jan.-May of years 2006-2009. Variables measured in currency are adjusted according to consumer price index and listed in 2009 equivalent currency units. Expenditures and value of productive equipment have the top and bottom 1% removed. Marital status is categorical with married as omitted category. Age of household head included in regression, but with small and statistically insignificant coefficient, so removed from table due to space constraints.

Table 4
Simultaneous Model of Intensive Margin of PSNP participation

	(1) Tobit	(2) Tobit	(3) Tobit	(4) Tobit
Annual household expenditures (100's birr)	-2.60***	-2.02***	-2.55***	-2.01***
	(0.17)	(0.16)	(0.17)	(0.16)
Number children aged 0-6	79.30***	95.20***		
	(7.85)	(8.32)		
Number children aged 7-15	77.15***	105.41***		
	(6.84)	(7.20)		
Number of adults aged 16-60	31.94***	83.13***		
	(7.35)	(7.91)		
Number adults aged 61+	33.69**	116.82***		
	(16.34)	(22.21)		
Number boys aged 0-6			75.97***	89.91***
			(10.44)	(10.77)
Number girls aged 0-6			79.49***	94.97***
			(10.15)	(10.38)
Number of boys aged 7-15			57.25***	90.14***
			(9.36)	(9.65)
Number of girls aged 7-15			99.69***	120.36***
			(9.74)	(9.83)
Number men aged 16-60			4.33	62.82***
			(9.85)	(10.39)
Number women aged 16-60			79.19***	109.45***
			(11.97)	(11.77)
Number men aged 61+			-35.60	87.74***
			(22.45)	(28.77)
Number women aged 61+			122.22***	143.67***
			(26.40)	(29.48)
Household head highest grade attained		-9.43**		-8.40**
		(3.68)		(3.69)
Marital Status: Single		200.26***		194.97***
		(60.11)		(59.75)
Marital Status: Divorced		120.00***		109.13***
		(30.86)		(30.80)
Marital Status: Widowed		116.32***		97.62***
		(23.32)		(24.48)
Household member has position in *kebele*		221.13***		219.85***
		(24.07)		(24.09)
Friend or relative has position in *kebele*		99.60***		99.71***
		(22.00)		(21.98)
Landholdings in hectares		-24.88		-24.69
		(16.62)		(16.48)
Livestock in tropical livestock units		-55.72***		-55.18***
		(5.02)		(5.00)
Value of productive equipment (100's birr)		-3.47		-2.87
		(3.06)		(3.05)
Death of a spouse		142.24***		150.29***
		(52.42)		(52.95)
Kebele-year fixed effects	Yes	Yes	Yes	Yes
Observations	13,645	13,645	13,645	13,645
F-test	4.280	4.650	4.281	4.660
Prob > F	0.000	0.000	0.000	0.000
Pseudo R^2	0.030	0.037	0.031	0.037

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

Note: Dependent variable is PSNP payments made between Jan.-May in years 2006-2009. Variables measured in currency are adjusted according to consumer price index and listed in 2009 equivalent currency units. Expenditures and value of productive equipment have the top and bottom 1% removed. Marital status is categorical with married as omitted category. Drought and illness of family member mentioned as important shocks were included in regressions, but results were small and statistically insignificant, therefore they are removed from this table for space.

Table 5
Sequential Model of Intensive Margin of PSNP participation

	(1) 2nd Stage	(2) 2nd Stage	(3) 2nd Stage	(4) 2nd Stage
Number children aged 0-6	81.74***	58.99***		
	(10.83)	(9.34)		
Number children aged 7-15	77.77***	67.62***		
	(7.84)	(8.16)		
Number of adults aged 16-60	74.65***	60.17***		
	(7.59)	(8.13)		
Number adults aged 61+	54.48***	55.65***		
	(15.48)	(19.85)		
Number boys aged 0-6			80.51***	56.99***
			(12.64)	(10.81)
Number girls aged 0-6			80.90***	58.81***
			(11.98)	(11.18)
Number of boys aged 7-15			79.36***	70.18***
			(10.12)	(9.89)
Number of girls aged 7-15			74.78***	63.48***
			(9.96)	(10.75)
Number men aged 16-60			84.00***	69.68***
			(10.23)	(10.55)
Number women aged 16-60			59.64***	46.59***
			(10.41)	(10.94)
Number men aged 61+			73.06***	63.06***
			(20.18)	(24.01)
Number women aged 61+			30.43	47.72
			(28.82)	(29.54)
Annual household expenditures (100's birr)		-0.01		0.01
		(0.17)		(0.16)
Household head highest grade attained		-4.18		-4.40
		(3.16)		(3.22)
Marital Status: Single		-35.33		-38.46
		(47.40)		(47.45)
Marital Status: Divorced		-180.88***		-180.41***
		(44.12)		(44.41)
Marital Status: Widowed		-137.05***		-134.02***
		(27.38)		(29.42)
Landholdings in hectares		37.03*		37.64*
		(20.64)		(20.64)
Livestock in tropical livestock units		10.07***		10.39***
		(3.55)		(3.43)
Value of productive equipment (100's birr)		-2.98		-3.22
		(5.71)		(5.68)
Drought mentioned as most important shock		-2.53		-3.19
		(19.46)		(19.56)
Death of a spouse		80.73		79.59
		(51.18)		(51.20)
Crops suffered from illness of household member		-31.85		-32.40
		(24.87)		(24.64)
Inverse Mills Ratio for conditional logit	-87.51***	-295.83***	-96.98***	-303.91***
	(29.99)	(69.87)	(32.76)	(67.47)
Kebele-year fixed effects	Yes	Yes	Yes	Yes
Observations	6,728	6,728	6,728	6,728
R-squared	0.65	0.66	0.65	0.66

Standard errors clustered at *kebele* level
*** p<0.01, ** p<0.05, * p<0.1

Note: Dependent variable is PSNP payments made between Jan.-May in years 2006-2009. PSNP payments and currency based variables are adjusted according to consumer price index and are listed in 2009 equivalent currency units. Expenditures and value of productive equipment have the top and bottom 1% removed. Marital status is a categorical variable with married as the omitted category. The local political participation variables are used in the first stage, but are excluded in the second stage.

Table 6

Foster, Greer, Thorbecke poverty metrics comparing simulated scenarios of centralized versus decentralized decision making in the issuance of PSNP payments

	α=0	**α=1**	**α=2**
Counterfactural: No PSNP payments	0.5879	0.2181	0.1077
	(0.0211)	(0.0122)	(0.0077)
Uniform payment to randomly selected group of PSNP participants	0.5723	0.2017	0.0950
	(0.0215)	(0.0114)	(0.0068)
Diluted payment to every PSNP participant	0.5719	0.2026	0.0955
	(0.0215)	(0.0115)	(0.0069)
Actual PSNP as implemented	0.5705	0.2025	0.0957
	(0.0217)	(0.0116)	(0.0069)

Note: Foster, Greer, Thorbecke (1984) poverty metrics and robust standard errors taking into account sampling weights in parenthesis. When α=0 the FGT metric is percent of population under the head count poverty line. When α=1 the FGT metric is the poverty gap, and when α=2 the FGT metric is the poverty gap squared.

Table 7

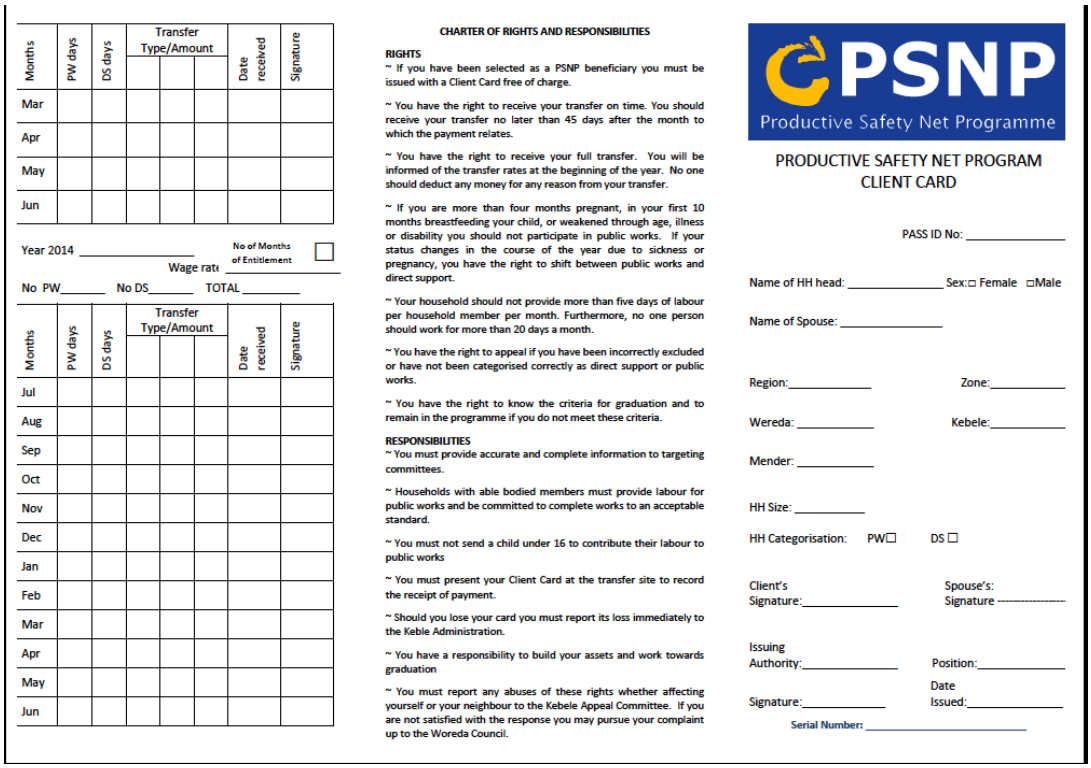
Foster, Greer, Thorbecke poverty metrics comparing simulated scenarios of the use of different equivalence scales to issue PSNP payments

	α=0	**α=1**	**α=2**
Counterfactural: No PSNP payments	0.5879	0.2181	0.1077
	(0.0211)	(0.0122)	(0.0077)
PSNP payments scaled by OECD equivalence scale	0.5705	0.2012	0.0951
	(0.0216)	(0.0116)	(0.0070)
PSNP payments scaled by modified OECD equivalence scale	0.5689	0.2013	0.0952
	(0.0216)	(0.0116)	(0.0070)
PSNP payments scaled by rule of thumb (Deaton 1997) equivalence scale	0.5710	0.2012	0.0950
	(0.0214)	(0.0116)	(0.0070)
Actual PSNP as implemented	0.5705	0.2025	0.0957
	(0.0217)	(0.0116)	(0.0069)

Note: Foster, Greer, Thorbecke (1984) poverty metrics and robust standard errors taking into account sampling weights in parenthesis. When α=0 the FGT metric is percent of population under the head count poverty line. When α=1 the FGT metric is the poverty gap, and when α=2 the FGT metric is the poverty gap squared.

Figure 1
PSNP Client Card

ANNEX 6: PSNP CLIENT CARD



Months	PW days	DS days	Transfer Type/Amount			Date received	Signature
Mar							
Apr							
May							
Jun							

Year 2014 _____ No of Months of Entitlement ☐
Wage rate _____
No PW_____ No DS_____ TOTAL _____

Months	PW days	DS days	Transfer Type/Amount			Date received	Signature
Jul							
Aug							
Sep							
Oct							
Nov							
Dec							
Jan							
Feb							
Mar							
Apr							
May							
Jun							

CHARTER OF RIGHTS AND RESPONSIBILITIES

RIGHTS

~ If you have been selected as a PSNP beneficiary you must be issued with a Client Card free of charge.

~ You have the right to receive your transfer on time. You should receive your transfer no later than 45 days after the month to which the payment relates.

~ You have the right to receive your full transfer. You will be informed of the transfer rates at the beginning of the year. No one should deduct any money for any reason from your transfer.

~ If you are more than four months pregnant, in your first 10 months breastfeeding your child, or weakened through age, illness or disability you should not participate in public works. If your status changes in the course of the year due to sickness or pregnancy, you have the right to shift between public works and direct support.

~ Your household should not provide more than five days of labour per household member per month. Furthermore, no one person should work for more than 20 days a month.

~ You have the right to appeal if you have been incorrectly excluded or have not been categorised correctly as direct support or public works.

~ You have the right to know the criteria for graduation and to remain in the programme if you do not meet these criteria.

RESPONSIBILITIES

~ You must provide accurate and complete information to targeting committees.

~ Households with able bodied members must provide labour for public works and be committed to complete works to an acceptable standard.

~ You must not send a child under 16 to contribute their labour to public works

~ You must present your Client Card at the transfer site to record the receipt of payment.

~ Should you lose your card you must report its loss immediately to the Keble Administration.

~ You have a responsibility to build your assets and work towards graduation

~ You must report any abuses of these rights whether affecting yourself or your neighbour to the Kebele Appeal Committee. If you are not satisfied with the response you may pursue your complaint up to the Woreda Council.

PSNP
Productive Safety Net Programme

PRODUCTIVE SAFETY NET PROGRAM
CLIENT CARD

PASS ID No: _____

Name of HH head: _____ Sex:☐ Female ☐Male

Name of Spouse: _____

Region:_____ Zone:_____

Wereda: _____ Kebele:_____

Mender: _____

HH Size: _____

HH Categorisation: PW☐ DS ☐

Client's Signature:_____ Spouse's: Signature ----------

Issuing Authority:_____ Position:_____

Signature:_____ Date Issued:_____

Serial Number: _____

HH Head PIC

Spouse PIC

Year 2010 _____ No of Months of Entitlement ☐
Wage rate _____
No PW_____ No DS_____ TOTAL _____

Months	PW days worked	DS days eligible	Transfer Type/Amount			Date received	Signature
Jul							
Aug							
Sep							
Oct							
Nov							
Dec							
Jan							
Feb							
Mar							
Apr							
May							
Jun							

Year 2011 _____ No of Months of Entitlement ☐
Wage rate._____
No PW_____ No DS_____ TOTAL _____

Months	PW days	DS days	Transfer Type/Amount			Date received	Signature
Jul							
Aug							
Sep							
Oct							
Nov							
Dec							
Jan							
Feb							
Mar							
Apr							
May							
Jun							

Year 2012 _____ No of Months of Entitlement ☐
Wage rate._____
No PW_____ No DS_____ TOTAL _____

Months	PW days	DS days	Transfer Type/Amount			Date received	Signature
Jul							
Aug							
Sep							

Months	PW days	DS days	Transfer Type/Amount			Date received	Signature
Oct							
Nov							
Dec							
Jan							
Feb							
Mar							
Apr							
May							
Jun							

Year 2013 _____ No of Months of Entitlement ☐
Wage rate._____
No PW_____ No DS_____ TOTAL _____

Months	PW days	DS days	Transfer Type/Amount			Date received	Signature
Jul							
Aug							
Sep							
Oct							
Nov							
Dec							
Jan							
Feb							

Figure 2
Histogram of share of *woreda* budget received versus needed according to planning documents

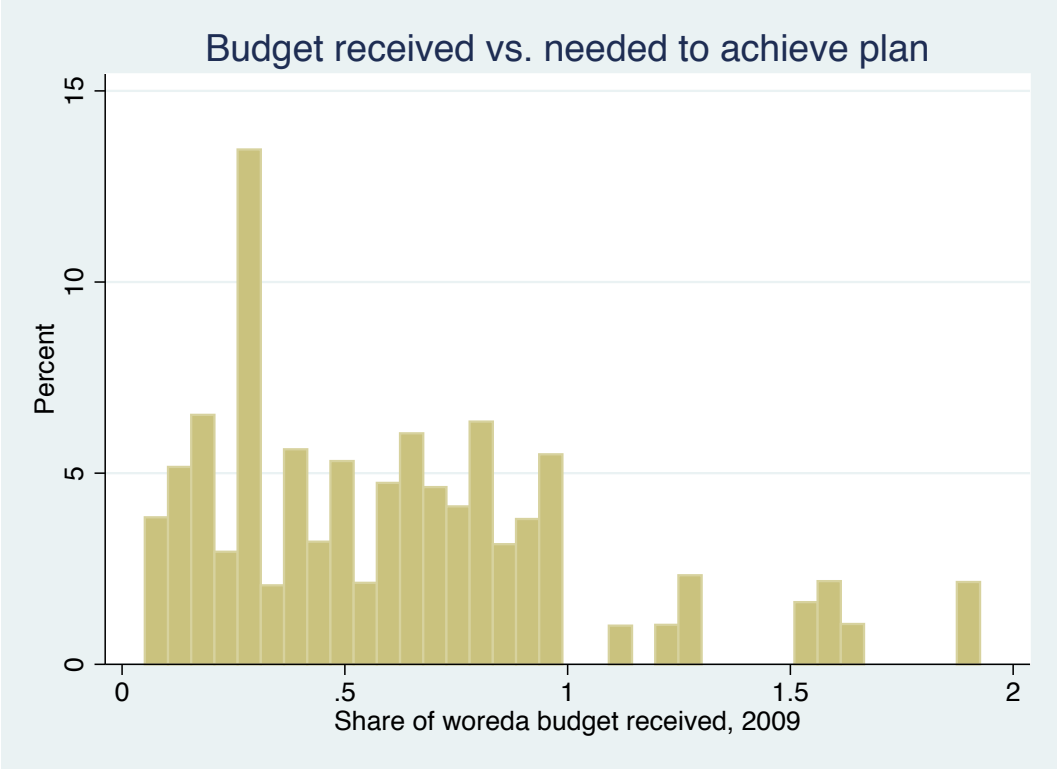


Table A1

Decomposition of Source Variation in Marginal Payments: Productive Safety Net Program (PSNP)

	kebele **source (ks)**	***woreda*** **source (ws)**	**zonal source (zs)**	**regional source (rs)**	**federal source (fs)**	**sample size (N)**
Kebele as reference point, step ahead	0.9160	0.0301	0.0346	0.0173	0.0020	1327
Kebele as reference point, step behind	0.9281	0.0286	0.0207	0.0202	0.0023	1327
Kebele as reference point, step ahead, smoothed	0.7786	0.0797	0.0873	0.0494	0.0050	1262
Kebele as reference point, step behind, smoothed	0.7829	0.0898	0.0551	0.0690	0.0033	1259
Woreda as reference point, step ahead	0.7976	0.1667	0.0208	0.0125	0.0023	1560
Woreda as reference point, step behind	0.7150	0.2455	0.0210	0.0174	0.0011	1540
Woreda as reference point, step ahead, smoothed	0.7949	0.0297	0.0903	0.0721	0.0129	1552
Woreda as reference point, step behind, smoothed	0.7315	0.0546	0.1119	0.0981	0.0038	1532
Average Source Variation (2006)	**0.8056**	**0.0906**	**0.0552**	**0.0445**	**0.0041**	**1420**

	kebele **source (ks)**	***woreda*** **source (ws)**	**zonal source (zs)**	**regional source (rs)**	**federal source (fs)**	**sample size (N)**
Kebele as reference point, step ahead	0.8739	0.0500	0.0518	0.0138	0.0104	1690
Kebele as reference point, step behind	0.8719	0.0535	0.0509	0.0131	0.0106	1679
Kebele as reference point, step ahead, smoothed	0.7480	0.0901	0.1179	0.0271	0.0168	1570
Kebele as reference point, step behind, smoothed	0.6863	0.1167	0.1438	0.0326	0.0207	1569
Woreda as reference point, step ahead	0.7148	0.2304	0.0238	0.0084	0.0226	2065
Woreda as reference point, step behind	0.6935	0.2613	0.0254	0.0111	0.0086	1994
Woreda as reference point, step ahead, smoothed	0.6859	0.0712	0.1028	0.0329	0.1071	2059
Woreda as reference point, step behind, smoothed	0.6865	0.0396	0.1546	0.0621	0.0572	1987
Average Source Variation (2007)	**0.7451**	**0.1141**	**0.0839**	**0.0251**	**0.0318**	**1827**

Table A1, continuation

Decomposition of Source Variation in Marginal Payments: Productive Safety Net Program (PSNP)

	***kebele* source (ks)**	***woreda* source (ws)**	**zonal source (zs)**	**regional source (rs)**	**federal source (fs)**	**sample size (N)**
Kebele as reference point, step ahead	0.8869	0.0670	0.0197	0.0150	0.0114	1702
Kebele as reference point, step behind	0.8742	0.0699	0.0325	0.0106	0.0129	1694
Kebele as reference point, step ahead, smoothed	0.7952	0.1178	0.0388	0.0307	0.0174	1588
Kebele as reference point, step behind, smoothed	0.8021	0.0982	0.0675	0.0157	0.0165	1584
Woreda as reference point, step ahead	0.7336	0.2389	0.0139	0.0048	0.0087	2091
Woreda as reference point, step behind	0.6690	0.3031	0.0127	0.0050	0.0102	2001
Woreda as reference point, step ahead, smoothed	0.7855	0.0451	0.0919	0.0273	0.0502	2083
Woreda as reference point, step behind, smoothed	0.6902	0.0615	0.1238	0.0404	0.0841	1996
Average Source Variation (2008)	**0.7796**	**0.1252**	**0.0501**	**0.0187**	**0.0264**	**1842**

	***kebele* source (ks)**	***woreda* source (ws)**	**zonal source (zs)**	**regional source (rs)**	**federal source (fs)**	**sample size (N)**
Kebele as reference point, step ahead	0.8519	0.0762	0.0361	0.0289	0.0069	1553
Kebele as reference point, step behind	0.8681	0.0631	0.0389	0.0224	0.0075	1511
Kebele as reference point, step ahead, smoothed	0.7272	0.1155	0.0781	0.0667	0.0124	1414
Kebele as reference point, step behind, smoothed	0.7605	0.1011	0.0770	0.0500	0.0115	1385
Woreda as reference point, step ahead	0.6162	0.3562	0.0190	0.0052	0.0033	1938
Woreda as reference point, step behind	0.6007	0.3688	0.0103	0.0136	0.0065	1840
Woreda as reference point, step ahead, smoothed	0.7769	0.0575	0.1188	0.0287	0.0180	1922
Woreda as reference point, step behind, smoothed	0.6782	0.0606	0.0969	0.1130	0.0513	1824
Average Source Variation (2009)	**0.7350**	**0.1499**	**0.0594**	**0.0411**	**0.0147**	**1673**

Source: calculations based on program payouts from the Ethiopian Food Security Survey

Note: For a given household the marginal PSNP payment is calculated by finding the difference between that household's payment and the mean payment of households in the same location that differed in size by one member. Within each year, rows 1,3,5,7 use a one-step-ahead estimator (rows 2,4,6,8 use a one-step-behind estimator). For example, a one-step-ahead (one-step-behind) estimator compares the actual payment of a participant household of size 4 with the mean payment received of participant households of size 5 (size 3) in the same geographic location. The reference location is either the *kebele* (rows 1,2,3,4) or *woreda* (rows 5,6,7,8). Simple non-parametric local smoothing is used to reduce the effect of outliers (rows 3,4,7,8) while no smoothing is used in rows 1,2,5,6. The sample includes all payments to households for the five month period (Jan.-May) each year and removes outliers (the top 1% and bottom 1% of marginal payments).

Table A2

Extensive Margin of PSNP participation (2006-2009), logistic regression results

	(1) FE logit	(2) FE logit	(3) FE logit	(4) FE logit
Log annual household expenditures	-0.90***	-0.67***	-0.90***	-0.67***
	(0.06)	(0.06)	(0.06)	(0.06)
Log household size	0.20*	0.83***	0.24**	0.86***
	(0.10)	(0.12)	(0.10)	(0.12)
Percent children aged 0-6	0.06	-0.45		
	(0.26)	(0.32)		
Percent children aged 7-15	0.26	-0.20		
	(0.25)	(0.31)		
Percent adults aged 16-60	-0.32*	-0.33		
	(0.18)	(0.23)		
Percent boys aged 0-6			-0.12	-0.54
			(0.29)	(0.36)
Percent girls aged 0-6			0.12	-0.50
			(0.29)	(0.34)
Percent boys aged 7-15			-0.00	-0.37
			(0.27)	(0.34)
Percent girls aged 7-15			0.39	-0.14
			(0.27)	(0.33)
Percent men aged 16-60			-0.61***	-0.55**
			(0.23)	(0.28)
Percent women aged 16-60			-0.07	-0.17
			(0.21)	(0.25)
Household head highest grade attained		-0.00		-0.00
		(0.02)		(0.02)
Marital Status: Single		0.69***		0.69***
		(0.25)		(0.25)
Marital Status: Divorced		0.73***		0.73***
		(0.17)		(0.17)
Marital Status: Widowed		0.60***		0.59***
		(0.11)		(0.11)
Household member has position in *kebele*		0.67***		0.67***
		(0.11)		(0.11)
Friend or relative has position in *kebele*		0.32***		0.33***
		(0.08)		(0.08)
Landholdings in hectares		-0.13***		-0.13***
		(0.04)		(0.04)
Livestock in tropical livestock units		-0.17***		-0.17***
		(0.03)		(0.03)
Value of productive equipment (100's birr)		-0.01		-0.01
		(0.01)		(0.01)
Drought mentioned as most important shock		0.02		0.02
		(0.08)		(0.08)
Death of a spouse		0.18		0.18
		(0.18)		(0.18)
Crops suffered from illness of household member		0.04		0.04
		(0.09)		(0.09)
Kebele-year fixed effects	Yes	Yes	Yes	Yes
Observations	15,548	13,645	15,548	13,645
Chi-square test	224.5	294.1	237.8	320.3
Prob > chi^2	0.000	0.000	0.000	0.000
Pseudo R^2	0.041	0.101	0.042	0.101

Standard errors clustered at *kebele* level

*** p<0.01, ** p<0.05, * p<0.1

Note: The data is pooled from Jan.-May of years 2006-2009. Variables measured in currency are adjusted according to consumer price index and listed in 2009 equivalent currency units. Expenditures and value of productive equipment have the top and bottom 1% removed. Marital status is categorical with married as omitted category. Age of household head included in regression, but with small and statistically insignificant coefficient, so removed from table due to space constraints.