

DRAFT

Public Safety Nets and Crowd-out of Informal Insurance
Arrangements: Evidence from Ethiopia

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Abstract

As low income countries start developing public welfare, they have the potential to displace informal insurance arrangements, which can leave households worse off than before the public program. This paper takes advantage of a significant change in the distribution of aid in Ethiopia, with the introduction of the Productive Safety Net Program, to assess the effect on membership in *iddir*, informal insurance groups providing assistance for funeral and other contingencies. Although I find evidence of substitution the effect is primarily driven by individuals with a high likelihood of receiving PSNP, whereas overall participation in informal insurance groups actually increases in PSNP villages. This effect is consistent with an explanation where the most at-risk individuals are drawn into public programs, making participation in the informal insurance network more attractive to others. Government safety net provision thus increases access to risk protection in the population. Furthermore, the decrease in adverse selection in informal insurance groups enables groups to provide additional services, such as loan provision, that were previously too risky, increasing individuals' level of risk protection.

Keywords: informal insurance; public safety nets; Africa; Ethiopia

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1 Introduction

Informal risk sharing networks are common in many rural areas of developing countries (Rosenzweig and Wolpin [1988]; Townsend [1994]; Ligon et al. [2000]; Ligon et al. [2002]; and Fafchamps and Gubert [2007]). Informal arrangements allow neighbors, friends, and relatives to borrow from one another following an economic shock but have known shortcomings as such groups can offer only incomplete risk protection. Informal arrangements help rural households cope with shocks because in much of the developing world formal insurance arrangements, both private and public, are missing.

As low income countries start developing formal public welfare systems, scholars have studied whether formal arrangements crowd-out informal arrangements or whether they can complement them (Albarran and Attanasio [2003]; Attanasio and Rios-Rull [2000]). However, there has thus far been little empirical research on the crowding-out effect of government provided assistance on informal insurance arrangements and only a further few demonstrate a causal effect. Additionally, research to date has not examined the implications of government provided assistance on informal insurance groups' composition and functioning. The selection into, or out of, informal insurance groups changes the characteristics of individual who remain in the groups and consequently, both the attractiveness of the group to others and the types of services that the group provides to members. This question has important policy implications because public safety nets change the incentives to participate in informal insurance groups. Thus, public assistance has the potential to either increase or decrease individuals' ability to shield themselves from risk compared to a world without public expenditures.

Contemporary rural Ethiopia provides an ideal setting to examine the consequences of government transfer programs on informal risk-management networks. Ethiopia has an agrarian based economy subject to frequent intense episodes of drought. Its population has had to devise risk-coping mechanisms to deal with a series of famines. Over the past century, Ethiopians developed a system of traditional risk-management networks called iddirs. Iddirs are funeral associations that ensure a payout in-cash and in-kind at the time of a funeral

for a deceased member of the family of a member of the group. However, iddirs serve many functions beyond providing financial support for funerals. A substantial number of iddirs offer other forms of insurance, for example for losses due to fires or destruction of crop or livestock, and many offer loans (Dercon et al. [2006]). People can and usually are members of more than one association for funeral insurance and the number of funeral associations can vary widely across areas (Dercon et al. [2006]). Furthermore, Ethiopia has a long history of food aid reliance and its aid distribution system has undergone a significant transformation over the last decade. Ethiopia is a large beneficiary of the global food aid system. In the 1990s, food aid transfers to Ethiopia were as high as 15 million tons annually (Jayne et al. [2002]).

Using the Ethiopian case, it is possible to analyze whether government aid crowds-out informal insurance arrangements. Since 2005, the Government of Ethiopia and a consortium of donors formed the Productive Safety Net Program (PSNP), a large scale safety net program reaching approximately eight million beneficiaries. The transition to the PSNP provided more reliable assistance, that reached a larger population, than the prior aid distribution system. The advent of PSNP provides a natural experiment to study whether public safety nets crowd-out informal insurance arrangements. To study this problem, I use four rounds of the Ethiopia Rural Household Survey (ERHS), between 1997 and 2009, a unique longitudinal household data set covering households in a number of villages in rural Ethiopia. The identification strategy takes advantage of the two step targeting procedure for PSNP: first, towards drought-prone regions and second, to food insecure households within these regions. I estimate individuals' propensity to receive PSNP and use this score in a linear probability model to estimate whether, after PSNP is introduced, individuals with a higher propensity to receive PSNP, living in PSNP villages, switch out of iddirs. This method allows me to compare changes in iddir membership among individuals living in a village that does not receive PSNP with individuals of a comparable propensity to receive PSNP, who reside in villages that do receive aid.

Results indicate that with PSNP individuals do select out of iddirs, however, this substitu-

tion actually increases overall risk protection in the population. The reason is two-fold. First, individuals with a high likelihood of receiving the safety net switch out of iddirs, however, the general population living in a village that receives PSNP actually increases their iddir participation. This effect is consistent with an explanation where the most at-risk individuals are drawn into public programs, making participation in the informal insurance network more attractive for others with the decrease in adverse selection in the group. Second, remaining iddirs provide services that complement PSNP. Remaining iddir insure against the idiosyncratic shocks that PSNP does not cover and are more likely to provide loans. Iddirs have deep, local knowledge about individuals' characteristics and the losses they experience that give them an advantage in providing insurance for idiosyncratic losses. And, with the selection of low risk types into iddirs and the selection of higher risks types out of iddirs, iddirs are more likely to provide loans that would otherwise be too costly for the group to provide.

2 Institutional Context

2.1 Government Assistance

Ethiopia has been one of the largest recipients of global food aid for the past several decades. From 1984 to 1998, it received almost 10 million metric tons, an average of almost 10% of national cereal production over this period. In bad production years food aid was as high as a fifth of domestic production. In the late 1980s, Ethiopia was receiving roughly 25% of all food aid deliveries to Africa, and as late as 1996 was still receiving 20% (Jayne et al. [2002] citing then current WFP website statistics). The amount of people in need of food assistance then rose from approximately 2.1 million in 1996 to 13.2 million in 2003, before falling back to 7.1 million in 2004 (World Bank website). In 2005, Ethiopia rolled out PSNP as a new form of safety net to curb the massive increases in international food assistance. PSNP has since become the largest safety net program in Africa, outside of South Africa. The program, originally scheduled to end in 2008, has been extended three times. Ten development partners

committed approximately US\$2.3 billion for the third phase of implementation (2010-2014) and a fourth phase is currently underway (2015-2020).

Food aid delivery in Ethiopia has long taken two main forms: food-for-work and free food distribution. The official goal has long been that work-based allocation (as in food-for-work or cash-for-work) programs account for 80% of all distributions (WFP, 1995). Food aid in Ethiopia is delivered using administrative targeting, with extensive decentralization. The amount of food to be allocated to each wereda (district) is determined at the central government level. Weredas are selected due to the regions' recurring droughts. The actual beneficiary households for either free food or food-for-work are designated at the local community level, by the kebele (village) committees. The kebele is a locally elected administrative unit, with close links to local, district and national political processes. This system of targeting was designed to account for the limited information available to central bureaucracies. Decentralized community based systems for transfer delivery may offer a mechanism to ensure service to the poor, as local government officials may have superior access to information about households in their community. Determinations are usually based on some underlying criteria such as land size, work ability and asset ownership.

The Government of Ethiopia and a consortium of donors developed PSNP in an effort to replace a food aid distribution dependent on emergency appeals. Emergency appeals may arrive too late, causing households to draw down their productive assets or resort to other coping strategies. Beyond ensuring reliable, timely support, PSNP aims to increase households' resiliency to shocks by building community and households' productive asset base. Like prior assistance, PSNP transfers are distributed through food or cash for work and free food or cash programs. Transfers are set at a level intended to smooth household consumption or fill the food gap over the annual lean period. Wage rates are reviewed annually and adjustments are made based on market food price changes. Benefits can represent the equivalent of approximately 10-40% of annual basic food needs as defined by Ethiopia's national poverty line (World Bank, 2010).

PSNP adopted a similar targeting procedure as governed prior aid distribution. Further,

the targeting guidelines incorporate prior aid receipt as a determinant of current PSNP receipt. Weredas are selected upon determination of being chronically food insecure and having been a recipient of food aid for a significant period in the past. Households are selected if they received food assistance prior to the formation of PSNP, face continuous food shortages, experience a severe loss of assets, and do not have other means of social protection. There is considerable evidence on possible biases in food transfer delivery against the poor in Ethiopia, in terms of geography, demography, gender or assets (Clay et al. [1999]; Jayne et al. [2002]; Coady et al. [2004]; Gilligan and Hoddinott [2007]). Both Clay et al. (1999) and Jayne et al. (2002) explain the targeting as the product of inertia. Geographical constancy stems from the regions' recurring droughts and decreases the need to conduct continual reassessments. However, constancy can also cause targeting errors stemming from any pre-existing bias and errors of exclusion and inclusion, due to changes in households' food insecurity status.

2.2 Informal Insurance Arrangements

In Ethiopia, iddir are associations that ensure a payout in-cash and in-kind at the time of a funeral for a deceased member of the family of a member of the group. Membership in iddirs provides financial assistance in times of death or illness. The insurance that these groups provide is substantial with payouts of approximately \$20 on average per group, which provides important protection for the insured households. Funeral expenses can cover a significant proportion of a month's income. The average cash payout per iddir is about 40% of monthly household consumption, so iddirs are crucial to households in helping cover these expenses (Bold, 2007). Member households generally pay a fixed monthly contribution and make a claim when they incur burial expenses. Some groups require member pay-in only when a funeral occurs whereas others adopt hybrid systems, collecting a small regular up-front payment and a larger pay-in when a funeral occurs.

Many iddir provide services beyond financial support for funerals. Dercon et al. (2006) find that a substantial number of iddirs offer other benefits to their members: 64% of groups

offer loans to members and 64% (but not necessarily the same groups as those offering loans) offer other forms of insurance. Some iddirs help unemployed members (Pankhurst and Mariam [2000]). And, beyond financial assistance, iddirs also provide social support from the community in the grievance process. Some iddirs also take on community development activities. Functions of iddirs have at times included establishing and maintaining good relations among members, coordinating members for community sanitation and crime prevention, and organizing and carrying out development projects.

Iddirs are believed to have evolved from migrant support organizations, possibly as late as the beginning of the 20th century, and to have spread rapidly after the Italian occupation (Pankhurst and Mariam [2000]). Unlike other forms of collective associations, such as cooperatives, iddirs are perceived as being separate from the state, although iddirs' relationship with the state is complex and has evolved over time. Departing from the two previous regimes, the current Ethiopian People's Ruling Democratic Front (EPRDF) regime does not interfere with names of iddirs, and their ethnic, regional, and religious composition. The current regime also does not curb the development role of iddirs, diverging from the prior militarist Derg regime. Nevertheless, a World Bank study of iddirs finds that informal institutions, such as iddirs, have a mistrust of outside agency, particularly from government (Butcher [2007]).

Despite being informal institutions, iddirs call regular meetings, keep minutes, and establish bylaws to regulate how funds will be collected and disbursed and how fines will be assessed. Data from the Funeral Insurance Survey reveal that the average group size of iddirs was about 85 members and all are substantially smaller than the community (Bold, 2007). Membership is clearly defined with written lists and does not change rapidly with members coming in and out. This formalization can be seen as a response to enforcement problems. Like other informal insurance arrangements, membership in iddirs must be self enforcing. Members called upon to make a transfer have incentives to defect. In any given period, only a few members will receive support and the others must be willing to remain in the system in case of future hardship. Further, commitment is not perfectly enforceable in these settings

(Ligon et al., 2002). Individuals cannot be forced to participate in the scheme and pay the transfers they are called to make. For the group to persist, at no point must individuals called upon to make a transfer have incentive to deviate and not make the transfer, given that they will be punished by some sort of exclusion from the scheme in the future (and possibly face other penalties). However, government provided social assistance can change members' incentives to remain in the group.

2.3 The Relationship between Formal and Informal Insurance

Theoretically, the inflow of additional income changes households' incentives to participate in informal insurance arrangements. Households may treat transfers of food aid or cash transfers as they would an insurance payout. Aid generates a positive income shock for recipient households, which should induce some redistribution among households according to a partial risk-sharing model. But insofar as it reaches those with low current income, aid also serves as a public transfer, thereby decreasing the need for private transfers. That is, aid, both in-cash and in-kind, can be used to pay for funeral and other contingencies previously covered by iddirs. Standard informal insurance models under enforcement constraints predict substitution: government transfers targeted to a particular person will change the outside options available and therefore increase incentives to leave the informal risk sharing groups (Cox and Jimenez [1992]; Attanasio and Rios-Rull [2000]; Cox et al. [2004]). Attanasio and Rios-Rull (2000) showed how the informal support system may break down due to the introduction of a formal insurance scheme, even if the formal insurance insures risks that are different from risks insured by the informal system.

Results from empirical studies are similarly mixed. Cox, Hansen and Jimenez (2004) find public expenditures crowd out significant portions of private transfers in the Philippines, but Gibson, Le, Olivia and Rozelle (2006) find in a preliminary study that no linear nor non-linear relationship exists between private transfers and income in Cambodia, Indonesia, Papua New Guinea and Vietnam, and conclude that expansions in public transfers have not crowded out private transfers in these countries. The evidence from within Ethiopia is also

mixed. There is some evidence from Ethiopia using earlier rounds of the ERHS that the presence of food aid in the community crowds out informal insurance (Dercon and Krishnan [2003]). However, the authors' test of the presence of informal risk-sharing arrangements is indirect: they examine the effect of food aid on log real consumption per adult. Changes in consumption caused by a village receiving aid may be due to informal arrangements other than membership in informal insurance networks, such as remittances. Conversely, aid may have other consequences, such as depressing food prices or disincentivizing labor participation, that are unrelated to informal insurance but affect consumption. In contrast to these findings, Lentz and Barrett (2005) do not find any evidence of substitution effects in Ethiopian food aid targeting. They find no significant impact of food aid on the amount of remittances received in southern Ethiopian and northern Kenyan households.

To further complicate an evaluation of the evidence, most of the empirical literature does not attempt to account for the selection of individuals into government programs. Differences among recipients and non-recipients complicate the identification of the effect of the program on informal arrangements. Albarran and Attanasio (2003) use the randomized roll-out of villages into Progresa, a conditional cash transfer scheme in Mexico, to show that public transfers decrease private transfers and do so more in villages where the variance of income is smaller. This paper contributes to the evidence base by revealing a causal effect of government transfers on self-enforcing, informal insurance groups.

3 Analysis

3.1 ERHS Data

The ERHS is a unique longitudinal household data set covering a number of rural Ethiopian villages. Data collection for the project started in 1989 and the last round of the ERHS was conducted in 2009. The long nature of the panel, unique among African data, allows for more precise estimation procedures by tracking the behavior of the same households, in the same villages, over time.

The ERHS surveys were carried out by Addis Ababa University, University of Oxford, and the International Food Policy Research Institute (IFPRI). ERHS data were collected in order to study the response of households to food crises. The study collected consumption, asset, and income data. The ERHS survey was redesigned in 1994 around core modules covering topics such as demographic characteristics, assets, income and consumption. In subsequent rounds, the modules were retained with little change in format while additional modules on specific topics were added and dropped on an ad hoc basis.

This analysis uses data beginning with the 1997 round of the ERHS, the first year in which questions on iddir membership were included in the survey. The 1997 survey covered 1477 households in 15 villages across the country. The 1999 and 2009 studies included three more villages. Survey rounds were conducted in 1997, 1999, 2004 and 2009. Attrition at the household level is low. Just under eight percent of the sample was lost between 1994 and 1999, and a further 5.2% were lost from 1999 and 2004. The attrition rate between 1994 and 2004 is 13.2% or 1.3% per year.

Despite the relatively large samples within each village, only 15 villages were sampled (18 in two rounds). Although ERHS data are not nationally representative, the data can be considered broadly representative of households in non-pastoralist farming systems as of 1994. Communities were selected to account for the diversity in the farming systems in the country, including the grain-plough areas of the Northern and Central highlands, the enset-growing areas and the sorghum-hoe areas. Within each village, random sampling was used, stratified by female headed and non-female headed households and landless households. Unfortunately, the information available for ex-ante or ex-post weighing of the sample when pooled is limited. Sampling size in each village was governed by an attempt to obtain a self-weighting sample, when considered in terms of farming system: each person (approximately) represents the same number of persons from the main farming systems. Table 1 below shows the summary statistics, by round, for the 1997 to 2009 rounds of the ERHS.

Sampled households are very poor: households living below the poverty line vary across

Table 1: Summary Statistics by Survey Round

	1997		1999		2004		2009	
	mean	sd	mean	sd	mean	sd	mean	sd
Government Aid	0.17	0.38	0.23	0.42	0.46	0.50	0.39	0.49
Climate Shock Index	1.20	1.19	1.68	1.68	1.70	1.58	2.36	1.53
Iddir Member	0.73	0.44	0.78	0.41	0.81	0.39	0.85	0.35
Below Poverty Line	0.32	0.47	0.22	0.41	0.25	0.43	0.45	0.50
Real Consumption Per Capita	93.19	117.76	96.87	86.54	99.07	98.56	59.72	44.90
Iddir loan amount in 2005 birr	13.31	87.47	11.11	75.01	25.41	166.38	19.74	112.24
Number of Members in Iddir	.	.	.	.	137.31	196.93	154.59	233.11
Iddir gives loans	.	.	.	.	0.41	0.49	0.45	0.50
Father was member of Iddir	.	.	.	.	0.40	0.49	0.40	0.49
Iddir pays for non-funeral events	.	.	.	.	0.41	0.49	0.43	0.50
Dependency Ratio	0.40	0.22	0.32	0.25	0.39	0.23	0.38	0.23
No Education	0.61	0.49	0.45	0.50	0.49	0.50	0.45	0.50
Head is Disabled	0.24	0.43	0.19	0.39	0.20	0.40	0.24	0.43
Plot Size (hectares)	0.37	6.70	0.48	7.57	0.20	1.41	0.87	6.03
Female Headed Household	0.23	0.42	0.25	0.43	0.30	0.46	0.34	0.47
Head is a Political Official	0.17	0.38	0.19	0.39	0.23	0.42	0.20	0.40
Parents are Political Officials	0.11	0.31	0.13	0.34	0.16	0.36	0.13	0.34
Relatives are Political Officials	0.28	0.45	0.32	0.47	0.39	0.49	0.32	0.47
Equb Member	0.16	0.36	0.13	0.34	0.17	0.38	0.14	0.34
Tigray Ethnicity	0.11	0.32	0.15	0.35	0.11	0.32	0.12	0.32
Oromo Ethnicity	0.24	0.43	0.29	0.45	0.24	0.43	0.24	0.43
Amhara Ethnicity	0.30	0.46	0.38	0.49	0.31	0.46	0.31	0.46
Muslim Religion	0.24	0.43	0.23	0.42	0.22	0.42	0.23	0.42
Protestant Religion	0.16	0.36	0.19	0.39	0.19	0.39	0.19	0.39
Orthodox Religion	0.53	0.50	0.53	0.50	0.53	0.50	0.53	0.50
Number of Villages	15		18		15		18	
Observations	1416		1646		1354		1541	
Number of Villages Receiving Aid	11		12		14		16	

survey rounds from approximately 20% to 40% of sampled households.¹ Real monthly per capita consumption averaged across survey rounds is approximately 90 birr in 1994 birr, but varies from a high of 100 birr in 2004 to a low of less than 60 birr in the last survey round in 2009 (in 1994 prices). Unadjusted consumption per capita in 2009 (i.e., in 2009 prices) was approximately 213 birr, which is equivalent to approximately \$24 USD/month (in 2009 dollars) at the average exchange rate in 2009 of approximately nine birr per US dollar. Approximately half the sample has no formal education while almost 20% can be considered to have some form of physical disability. Households experience a fair number of climate shocks, measured as an additive index ranging from zero to five, based on their reports of insufficient rainfall, rains not stopping on time, etc. Political connectivity varies significantly across households. Only approximately 13% of households report that the household head's parents held an official position but more than 30% report that they have relatives who do. On average, 30% of households receive government assistance (financed by a combination of the Ethiopian government and international sources), but there is significant variation in receipt of government aid across survey rounds.

3.2 Propensity to Receive Aid

This paper tests whether households who receive PSNP switch out of iddirs, their informal insurance networks. There is an upward trend in the share of iddir members receiving aid before PSNP, but this trend reversed with the advent of PSNP in 2005. In contrast, the share of non-iddir members who receive aid increases over the study period. However, as PSNP receipt is likely to be driven by numerous variables, such as wealth, which could also affect membership in iddirs, it is necessary to estimate a model that isolates the causal effect of PSNP on iddir membership. To do so, I first estimate a propensity to receive PSNP for households who live in a PSNP village in 2009, the last year of the survey. 2009 is the

¹ The poverty line used for each period uses the same basket throughout, but valued at the prices for the survey period.

only post-program period available in the survey, as ERHS survey rounds were conducted in 2004 and again in 2009, and PSNP was rolled-out in 2005. Then, I examine the effect of the interaction of the propensity to receive PSNP, a dummy indicating whether a household resides in a village that receives PSNP, and an indicator for the year 2009, the last survey round, on iddir membership.

The identification strategy captures the treatment effect of receiving PSNP by comparing individuals with similar propensities to receive PSNP who reside in villages that receive PSNP, to their counterparts who do not reside in villages that receive PSNP. This paper diverges from Duru (unpublished, 2015) by taking advantage of the pre-treatment data available in ERHS to compare individuals, in PSNP and non-PSNP villages, pre and post PSNP treatment. In a PSNP village, I expect a large drop off in iddir membership rates when moving from a low likelihood PSNP candidate household, say a husband and wife with no dependents, to a high candidate household, such as a female headed household with many dependents. However, I expect no change in iddir membership rates when conducting a similar comparison, of low and high candidate households, among households who do not live in a PSNP village, since even high need households will not be able to access PSNP in non-PSNP villages.

I model the propensity to receive government assistance based on a large number of demographic, political, and economic factors. Coefficients are included with an eye towards explaining as much of the variation in PSNP receipt as possible. However, I only include “deep” explanatory variables, that are unlikely to vary significantly over time so as to avoid including variables that could be affected by prior aid receipt, and hence cause simultaneity bias. For example, including variables such as consumption or assets is problematic because prior aid receipt is likely to affect these variables. I include indicators for the major ethnic groups, with “other” being the omitted category, and religious groups, with Orthodox Christian, the dominant religion in Ethiopia, as the omitted category. Other demographic indicators include indicators for being a female-headed household, the household head having no formal education, and the household head being physically disabled. I considered a

household head to be physically disabled if they reported they couldn't stand up after sitting, sweep the floor, walk for five kilometers, or hoe a field for a morning. The dependency ratio varies from zero to one, and is measured as the share of household members aged less than 13 or older than 65 to total household members.

Economic variables include a measure of the amount of land the household owns. A dummy is included for equb members, which are informal savings associations. Objective climatic indicators, such as rainfall, are not readily available at the level of resolution used in this study.² Therefore, I construct an index of climatic shocks based on subjective measures of experience with climate shocks. The index is the sum of the following five self-reported indicators: the kiremt (main rainy season) rains not coming on time, not enough rain at the beginning of the rainy season, rains not stopping on time, rain during the harvest, and insufficient rain during the growing season. High scores on the climatic index indicate more negative economic shocks. Miguel (2005) finds a high correlation between reports of droughts or floods and actual rainfall in Tanzania, suggesting that subjective climate reports are reliable. Finally I include three political measures based on political connections: whether the household head, parents of the household, or relatives of the household hold official positions with the local political leadership, such as being a member of the village council. Other political measures, such as vote shares, are not available in the survey, but are unlikely to be informative since opposition parties were absent during the majority of the study period.

A probit model was run of PSNP receipt on all explanatory variables, in PSNP villages, in the last survey round only. This model isolates determinants of receiving PSNP to develop a model of an individual's propensity for receiving PSNP, that can then be applied to an unrestricted model, of non-aid villages and in pre-program years. Table 2 shows the results of the probit model of PSNP receipt.

² The Ethiopian Meteorological Agency collects data on rainfall but does not make these publicly available.

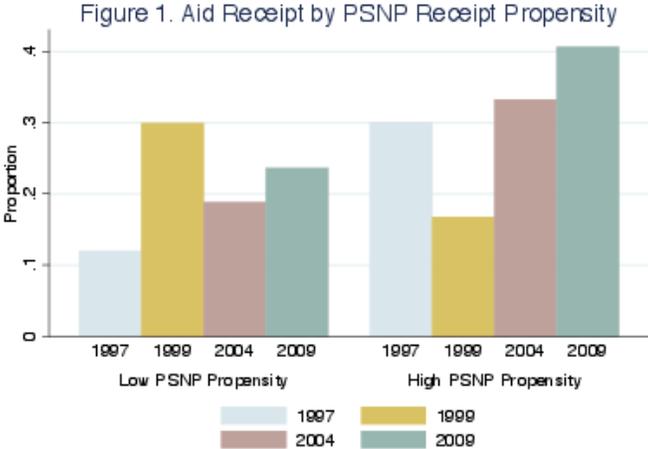
Table 2: Probit model of PSNP Receipt, in PSNP Villages in 2009

	PSNP b/se
Relatives are Political Officials	0.059 (0.09)
Head is a Political Official	0.000 (0.10)
Parents are Political Officials	-0.047 (0.11)
Climate Shock Index	0.102*** (0.03)
Dependency Ratio	0.219 (0.17)
No Education	0.125 (0.09)
Plot Size (hectares)	-0.231*** (0.08)
Equb Member	-0.597*** (0.13)
Female Headed Household	0.140 (0.09)
Head is Disabled	-0.039 (0.09)
Orthodox Religion	0.498** (0.20)
Tigray Ethnicity	1.033*** (0.17)
Oromo Ethnicity	-0.239 (0.15)
Amhara Ethnicity	-0.161 (0.14)
Muslim Religion	0.788*** (0.21)
Protestant Religion	0.333* (0.20)
Constant	-0.943*** (0.21)
Observations	1189
Pseudo R^2	0.1587

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Robust standard errors in parentheses.

Ethnicity and religion explain a large component of the variation in receipt of PSNP. This may be due to geographic clustering of individuals of the same ethnicity and religion, which could covary with other pertinent, but uncontrolled for, variables like average rainfall. Of the economic variables, plot size ownership and equb membership negatively predict PSNP receipt whereas the index of self-reported experience with climate shocks positively predicts receipt of PSNP. None of the political connections variables are significant predictors of PSNP receipt. These results are surprising given Caeyers and Dercon (2012) finding of increase in probability of aid receipt (before the advent of PSNP) due to political connections of 12%. Overall, the model explains about 16% of the variance in receipt of PSNP. This is similar to the pseudo R-squared found in other models of aid receipt in Ethiopia. Caeyers and Dercon’s (2012) models of free food and food-for-work vary from a low pseudo R-squared of 0.105 to a high of 0.19. The overall rate of correct classifications of the above model is over 65%, with over 75% of the normal weight group correctly classified and 53% of the low weight group correctly classified.

Figure 1 below shows the share of households receiving aid according to high or low PSNP propensity scores, across the survey rounds. Low scores are defined as less than a 50% probability of receiving PSNP and high scores as greater than 50%. With the exception of 1999, higher PSNP scores predict receipt of government aid across the survey rounds. Further, aid receipt peaks in 2009.



4 Results

4.1 Risk Protection Access

The working hypothesis states that households that are targeted for aid will stop investing in their informal insurance arrangements. To measure the impact of government aid on participation in informal insurance networks I interact the propensity score from the above probit regression, the dummy indicating whether a household lives in a village receiving aid, and an indicator for the year 2009, the post PSNP period. This model isolates the treatment effect of receiving PSNP without controlling for actual receipt of PSNP, by capturing those individuals highly likely to be selected for PSNP, and enabling a comparison with their counterparts who do not receive PSNP (e.g., either they are observed before PSNP roll-out or live in villages not receiving PSNP). I also include controls for an index of political connections, economic need, and experience with climatic risks. The political index ranges from zero to three, based on households' official political connections, their parents' connections, and their relatives' connections. The economic need index is the sum of the dependency ratio, having no education, being a smallholder farmer (defined as a household who owns less than 0.25 hectares of land), being female headed, and being disabled, and ranges from zero to five. The climatic shock index ranges from zero to five, as described above. I include village fixed effects to control for unobserved, but constant, variation at the village level over time and survey round fixed effects, to difference out any yearly variation that is likely to affect both PSNP receipt and iddir membership, such as the state of the economy.

Given the small number of villages (15 in two survey rounds and 18 in the other two), I ran one-way analysis-of-variance models on government aid to determine whether to include bootstrapped standard errors, as suggested in Cameron, Gelbach, Miller (CGM) [2008] for improved inference with few clusters. The intra-cluster correlation is 0.21 for government aid. As there is a relatively high correlation within villages (and little across villages), I run a wild bootstrap. High intra-cluster correlation combined with a small number of clusters leads to low statistical power. Standard asymptotic tests can over-reject with few (five to thirty) clusters. CGM's bootstrapping procedure corrects the standard errors by implementing a

bootstrapping procedures that leaves the regressors at their sample value, but resamples the response variable based on the residuals values. Table 3 shows the results of probit and OLS specifications first, adding in fixed effects to OLS next, and then with bootstrapped standard errors.

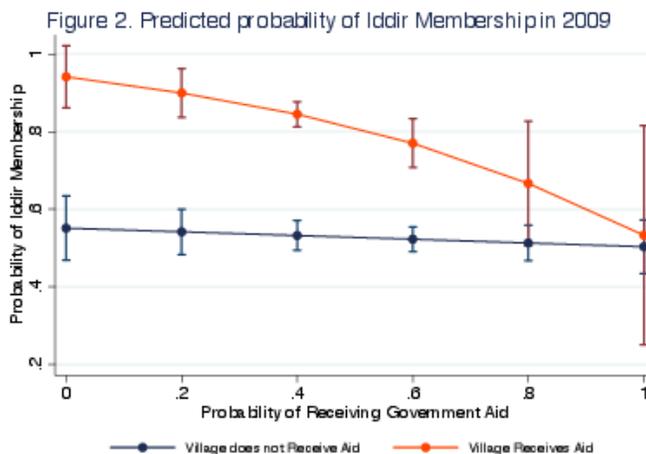
Table 3: Impact of PSNP on Iddir Membership

	(1)	(2)	(3)	(4)	(5)
	Probit	OLS	OLS	Bootstrap OLS	Bootstrap OLS
	b/se	b/se	b/se	b/se	b/se
Propensity*PSNP Village*2009	-2.674** (1.18)	-0.478*** (0.17)	-0.370** (0.15)	-0.360** (0.18)	-0.370** (0.18)
PSNP Village*2009	0.169 (0.48)	-0.015 (0.06)	0.209*** (0.06)	0.211*** (0.00)	0.209*** (0.00)
Propensity*2009	1.420 (1.06)	0.518*** (0.16)	0.215 (0.15)	0.208** (0.10)	0.215** (0.10)
Propensity*PSNP Village 2009	-2.349 (1.43)	-0.598*** (0.14)	0.116 (0.13)	0.121 (0.14)	0.116 (0.14)
Propensity	-2.215* (1.21)	-0.659*** (0.14)	-0.197 (0.12)	-0.219* (0.13)	-0.197* (0.11)
PSNP Village	1.434** (0.59)	0.338*** (0.05)	-0.016 (0.04)	-0.025 (0.07)	-0.016 (0.11)
Political Index	0.154** (0.06)	0.024*** (0.01)	0.021*** (0.00)		0.021*** (0.00)
Climate Shock Index	0.162** (0.07)	0.038*** (0.00)	0.010*** (0.00)		0.010** (0.00)
Economic Need Index	0.033 (0.07)	0.010* (0.01)	-0.016*** (0.00)		-0.016 (0.01)
Constant	1.108*** (0.38)	0.897*** (0.05)	0.592*** (0.05)	0.741*** (0.00)	0.592*** (0.00)
Observations	4884	4884	4884	4884	4884
Round Fixed Effects	No	No	Yes	Yes	Yes
Village Fixed Effects	No	No	Yes	Yes	Yes

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Propensity is the propensity to receive PSNP in a PSNP village in 2009, estimated in a probit regression including demographic, economic, and political variables.

Results are consistent across all model specifications and show a significant, negative relationship between PSNP and iddir membership for individuals with a high likelihood of receiving PSNP. According to the OLS specification with fixed effects, in non PSNP villages in 2009, the marginal effect of going from zero to 100% propensity to receive PSNP on iddir membership is an increase in probability of less than two percent, and is not statistically

significant. However, in PSNP villages in 2009, the marginal effect of moving from zero to 100% propensity to receive PSNP on iddir membership is a decrease in probability of nearly 24%, and is a statistically significant difference. Figure 2 below plots the predicted probability of iddir membership in 2009, as the probability of receiving PSNP changes, for PSNP and non-PSNP villages.



As Table 3 and Figure 2 reveal, however, the main effect of a village receiving PSNP, in the post-treatment period, is actually an increase in iddir membership. Only individuals with a high propensity of receiving PSNP (approximately 80%) substitute away from iddirs. In 2009, an average individual in a PSNP village is almost 30% more likely to belong to an iddir than an average individual in a non PSNP village. This effect is consistent with an explanation where the most at-risk individuals, who have the highest propensity of receiving PSNP, are drawn into public programs. The selection of high risk types out of iddirs decreases adverse selection in the group and makes participation in the informal insurance network more attractive for others in the village. Government safety net provision thus increases access to risk protection in the population.

4.2 Risk Protection Levels

An additional implication of the change in incentives brought about by PSNP on iddir

membership is that iddir may change the types of services that they provide. It is likely that this effect is driven by the selection of high risk types out of iddirs, once these households have a free public insurance option. As the iddirs start to attract less risk-prone members with the decrease in adverse selection in the group, the groups are able to provide services that were previously too risky.

Iddirs have localized knowledge that enable them to ascertain individuals' distinct losses. It is extremely costly for a state government to ascertain and verify every individual loss, and is instead better equipped to insure against losses, such as droughts, that affect entire villages. Indeed, such covariate shocks would overwhelm the insurance capacity of an iddir. From an individual members perspective, they will be more fully protected if they can leverage the insurance provided by PSNP against covariate shocks and the insurance provided by iddirs against idiosyncratic shocks, such as funerals. Further, unlike PSNP, certain iddirs also provide loans. Similar to insurance for idiosyncratic losses, loans are complementary services to PSNP that rely on localized knowledge to ascertain and ensure the likeliness of repayment by a loan recipient. Iddirs' social function in communities not only enables them to know who a good candidate is for receiving a loan, in terms of the likeliness of repayment, it also ensures members' ability to monitor the recipients' behavior and apply social pressure to ensure loan repayment.

It may be the case that individuals choose to remain in iddir that provide complementary services to PSNP (Duru, 2015 unpublished shows that PSNP substitutes for private insurance where both cover covariate climate risks). I am able to separate this alternative mechanism from the change in iddir service provision caused by the reduction in adverse selection, as explained above. The main effect of the interaction of the post program period, 2009, with a PSNP village reflects changes in iddir service provision for an average individual in a PSNP village. This effect should reflect changes caused by general changes in the types of individuals belonging to iddirs, with PSNP provision. I consider this coefficient to be indicative of effects caused by changes in adverse selection in the informal insurance group. The triple interaction of 2009, PSNP village, and the propensity to receive PSNP isolates the

characteristics of the types of iddirs that individuals who are more likely to receive PSNP remain in, and so is indicative of what I will call a selection effect.

I conduct two tests to determine whether with PSNP individuals are more likely to belong to iddir that provide complementary services. Using the above specification, I test whether PSNP households are more likely to belong to iddirs that provide loans. I also test whether households that receive PSNP are more likely to belong to iddir that pay for non-funeral expenses, such as fire or crop insurance. In addition, I test other variables to determine how the composition and functioning of the iddirs compare across individuals who receive PSNP. I analyze whether individuals might not only belong to iddirs that provide a select subset of services, but whether they are also more likely to belong to iddirs that require regular upfront monthly membership fees, as opposed to iddirs that only require fees be paid when a death of a member occurs, or a combination of upfront fees and fees following a death. One way to interpret this coefficient is its effect on whether members can be trusted to provide contributions in the event of a loss of another group member, when they have an incentive to renege on their commitment, or whether they are required to provide upfront fees, because their likeliness of renegeing on the group commitment is too great. Finally, I test whether the iddirs they belong to have fewer members. Smaller iddirs are likely to provide less risk protection as they cannot pool risk across a wide number of individuals. In larger iddirs, members are unlikely to experience (idiosyncratic) shocks at the same time and will be more likely to have different risk profiles. However, smaller iddirs may also be composed of individuals who are more closely connected, increasing their informational and sanctioning capacity.

Table 4 shows the effect of PSNP receipt on indicators of the types of iddirs that households belong to. All models include the triple interaction of the propensity to receive PSNP with indicators for living in a PSNP village and the year 2009, as well as all subcomponents of the interaction. Controls are included for political connections, economic need, and climate shocks. All models are run with OLS with wild bootstrap standard errors and village fixed effects. The dummy variable for 2009 serves as a round fixed effect, since only two rounds of

data are available on membership in iddir types. The number of observations differs slightly between the specifications due to survey non-response.

The triple interaction results show the effect on the types of services that iddirs provide, after PSNP was introduced, for individuals in a PSNP village, as the likeliness of an individual receiving PSNP increases. The main effect of post program with PSNP village reflects the effect on iddir membership type for the average PSNP villager. The former result can thus be interpreted as the effect on the types of iddir that high versus low propensity individuals choose to remain in, since these are the individuals who were shown in Table 3 to switch out of iddirs once given PSNP. This is the “selection effect,” revealing the types of iddirs that individuals with differing propensities to receive PSNP remain in, in PSNP villages. The latter result is the “adverse selection effect,” which shows changes in the types of iddir services provided deriving from compositional adjustments in iddir membership, with the influx of individuals in PSNP villages to iddirs.

Across all model specifications, results are consistently negative for the triple interaction term, which includes the individual propensity to receive PSNP, and consistently positive for the interaction term of the post treatment period and PSNP village. However, underlying the coefficients are more nuanced effects. Focusing first on the model predicting whether individuals belong to iddirs that provide loans, Figure 3 reveals that in the post PSNP period, individuals residing in villages that receive PSNP are more likely to belong to iddirs providing loans than individuals residing in villages that do not receive PSNP. Results are statistically different among PSNP and non PSNP villages for an average propensity of receiving PSNP of approximately 40%. Interestingly, results do not vary within a PSNP village as individuals become more likely to receive PSNP, whereas in non PSNP villages individuals with higher propensity to receive PSNP are significantly less likely to be members of iddirs providing loans. A probable explanation, that is consistent with the adverse selection mechanism, outlined above is that in PSNP villages high risk types select out of iddirs, so iddirs can provide loans to all members. Further, these individuals may have more access to cash or food from PSNP that they can share with other group members. In non PSNP

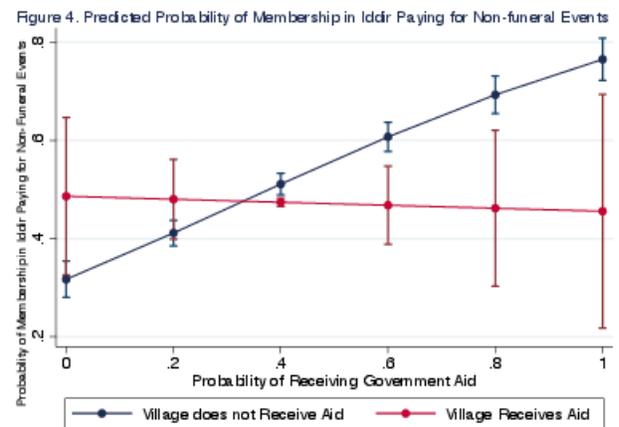
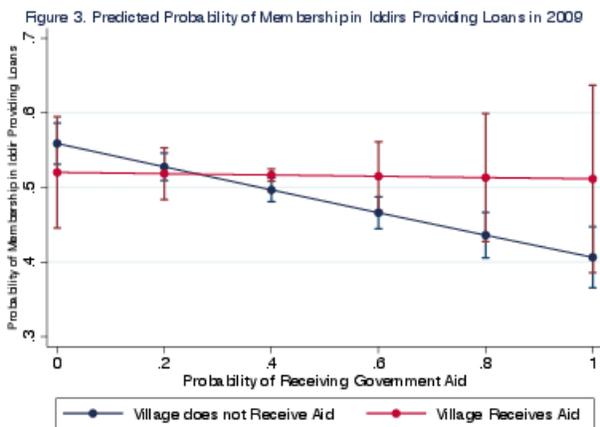
Table 4: Effect of PSNP on Iddir Composition and Service Provision

	(1)	(2)	(3)	(4)
	Iddir gives loans	Non-Funeral Events	Regular Fees	Membership
	b/se	b/se	b/se	b/se
Propensity*PSNP Village*2009	-0.844** (0.41)	-2.227** (1.08)	-2.004** (0.98)	-335.084** (163.07)
PSNP Village*2009	0.150*** (0.00)	0.597*** (0.00)	0.655*** (0.00)	117.281*** (0.00)
Propensity*2009	0.820*** (0.00)	2.308*** (0.00)	1.970*** (0.00)	336.631*** (0.00)
Propensity*PSNP Village	1.041*** (0.00)	1.635*** (0.00)	1.691*** (0.00)	226.764*** (0.00)
2009	-0.130** (0.06)	-0.608** (0.30)	-0.608** (0.30)	-116.020** (56.46)
Propensity	-1.041** (0.51)	-1.792** (0.87)	-2.029** (0.99)	-291.126** (141.68)
PSNP Village	-0.214** (0.10)	-0.399** (0.19)	-0.502** (0.24)	-70.003** (34.07)
Political Index	0.022*** (0.00)	0.008 (0.02)	0.041*** (0.00)	4.069 (8.70)
Climate Shock Index	0.005 (0.01)	-0.004 (0.01)	0.027*** (0.00)	1.939 (3.70)
Economic Need Index	0.005 (0.00)	-0.013 (0.01)	-0.001 (0.00)	3.849 (4.20)
Constant	0.533*** (0.00)	0.911*** (0.00)	1.396*** (0.00)	167.051*** (0.00)
Observations	2539	2540	2567	2525
Village Fixed Effects	Yes	Yes	Yes	Yes

* indicates significance 10 percent, ** at 5 percent, and *** at 1 percent. Wild bootstrapped standard errors in parentheses. Propensity is the propensity to receive PSNP in a PSNP village in 2009, estimated in a probit regression including demographic, economic, and political variables. Provides loans indicates whether the iddir provides loans to members. Non-funeral events indicates whether the household belongs to an iddir that makes payments for non-funeral expenses. Regular fees indicates whether the household belongs to an iddir that requires regular monthly fees. Membership indicates the number of members in the largest iddir the household belongs to.

villages, high risk types, that have a high propensity of receiving aid, are considered too risky to be given loans, although they remain in iddirs as this is the only risk-management mechanism available to them.

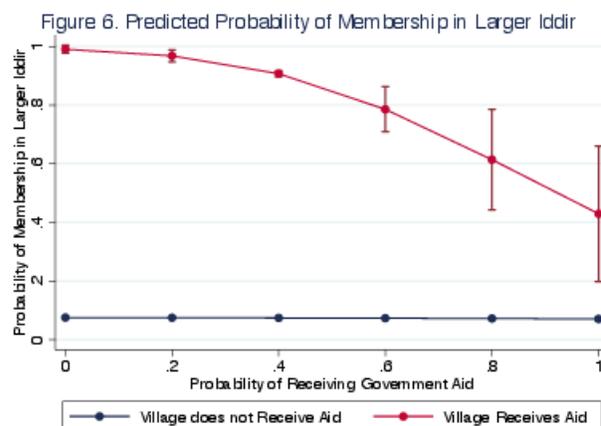
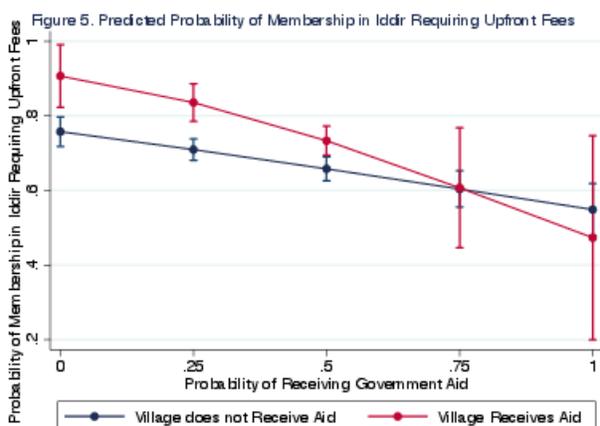
Turning next to the model predicting membership in iddir paying for non-funeral events, Figure 4 shows a broadly similar trend. In PSNP villages, individuals have a relatively constant probability of belonging to iddirs that provide support for non-funeral expenses. However, in villages that do not receive PSNP, as individual propensity to receive PSNP increases, individuals are increasingly more likely to belong to iddirs that provide non-funeral support. An explanation that is consistent with these results is that in PSNP villages, individuals who remain in iddir have protection against covariate risks through PSNP. Iddirs in PSNP villages can thus focus on providing support for funerals and idiosyncratic shocks that PSNP does not cover. However, in villages not covered by PSNP, individuals that are higher risk types will select iddir that can provide them with non-funeral expenses, for example for crop losses, since they do not have this protection through PSNP. This explanation is again consistent with the adverse selection mechanism since, unlike in non PSNP villages, in PSNP villages there is no difference in iddir membership type among the spectrum of propensities to receive PSNP.



The latter two models reveal the work of a different mechanism at play. As Figure 5 shows for a model predicting membership in iddirs that require regular upfront fees, and not fees be

paid in the event of a member's death or other loss, in PSNP villages, as individuals become more likely to receive PSNP they are significantly less likely to belong to iddir that require upfront fees. This pattern is consistent with the selection mechanism whereby individuals within PSNP villages, who are more likely to receive PSNP, choose to remain in certain types of iddirs. These individuals who are likely to receive PSNP may switch out of iddir that are more financially onerous, by requiring that they give regular contributions to the group.

Figure 6 shows a similar relationship where individuals in PSNP villages that are more likely to receive PSNP are less likely to belong to large iddir. In contrast, in non PSNP villages, comparing across the spectrum of likeliness of receiving PSNP, there is no difference in the size of iddirs that individuals belong to. However, this relationship may be merely mechanical. As shown in Figure 2 above, individuals who get PSNP are likely to switch out of iddir, and other, less risky types may join the iddirs due to the reduction in adverse selection in the groups. Thus, higher risk types who remain in iddirs may belong to smaller groups, whereas less risky types could join iddirs with other similar low risk types.



5 Conclusion

This paper focuses on the consequences of public safety net programs on membership in informal insurance arrangements. It shows that in Ethiopia, the transition to the PSNP, a large-scale safety net program meant to increase households' resiliency to shocks, formed a

substitute to the iddir, informal associations that help households insure against funeral and other contingencies. However, the government program was targeted according to economic need, meaning that higher risk types were more likely to leave iddir. The reduction in adverse selection into informal insurance groups actually made the group more attractive to other individuals in PSNP villages, who were more likely to belong to iddirs in the post program period.

Beyond substitution effects in membership in informal insurance groups, this paper analyzes the effects on the “intensive margin” by examining the effect of PSNP provision on the types of services that informal insurance networks provide. It shows that due to the exit of higher risk types out of iddir, other villagers in PSNP villages are more likely to belong to iddir covering idiosyncratic shocks and providing loans. These services rely on the comparative advantage of iddir in providing knowledge about group members individual specific losses and their likeliness of repayment. Households in PSNP villages thus maximize their risk protection by drawing on both the services provided by PSNP, for protection from large covariate shocks, and those that iddirs can provide, against idiosyncratic losses and for loan provision. Policymakers can learn from PSNP and seek to maximize the gains from safety nets by explicitly designing programs to complement pre-existing informal arrangements.

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