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Community participation and the quality of rural infrastructure in Ethiopia

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Abstract

Ethiopia's Productive Safety Net Program (PSNP) is one of the world's largest food security programs. The program supports chronically food insecure rural households and at the same time promotes long-term food security through the creation of rural infrastructure. While studies on the PSNP have examined various features of the program, there is limited knowledge on the quality and durability of infrastructure built through the program. Ensuring and maintaining the quality of local public goods built through the PSNP and similar social protection programs is a costly and recurring issue. Motivated by the long-term objective of the program, this paper analyses the role played by a key design feature of the PSNP, that is, its Community Based Participatory Watershed Development approach in influencing a project's physical condition and its operational status. The paper is based on survey data and technical assessments provided by soil and water conservation engineers covering a sample of 249 Soil and Water Conservation (SWC) projects located in 53 watershed communities. The survey is complemented by qualitative information gathered through interviews and discussions. The location of multiple projects, with differing levels of participation in the same watershed communities permits estimation of the effects of community participation after controlling for community fixed effects. We find that projects in which beneficiaries play a larger role in project monitoring and evaluation are substantially less likely to be damaged and be in better operational condition. These results support the idea that community participation translates into more durable infrastructure.

Keywords

Productive Safety Net Program, community participation, quality rural infrastructure, Ethiopia

Acronyms

CBD	Community Based Development
CBPWD	Community Based Participatory Watershed Development
CDD	Community Driven Development
EFSSs	Ethiopian Food Security Surveys
HABP	Household Asset Building Programme
FGDs	Focus Group Discussions
FSP	Food Security Program
KIIs	Key Informant Interviews
OSNP	Other Safety Net Programs
PSNP	Productive Safety Net Program
SRG	Structure Response Group
SWC	Soil and Water Conservation
TLU	Tropical Livestock Units

1. Introduction

Since the mass famine in 1983-84, Ethiopia has tried different measures to tackle deep-rooted poverty. These range from regular annual food aid to emergency food assistance. The latter has been delivered either as payments for public works or direct support. Though these measures have been successful in averting mass starvation, they have not yet banished the threat of further food insecurity. Keeping this in mind, recent efforts have focused on the promotion of rural livelihoods by building local infrastructure assets through different food security programs (MoARD, 2010).

In 2003, the government initiated a consultation with development partners for an alternative to the existing emergency response of channelling food aid to fill consumption gaps. This alternative was aimed at supporting the needs of chronically food insecure households while at the same time developing long-term solutions to tackle the root causes of food insecurity. The process ended by proposing a Food Security Program (FSP) which encompassed a shift from an emergency relief system to sustainable food security. This program was formally launched in January 2005 with the name Productive Safety Net Program or PSNP (Gilligan et al., 2009). The PSNP has three inter-connected objectives. First, to protect beneficiaries against hunger by providing cash and/or food during periods of food shortage, second, to prevent further impoverishment by protecting the sale of household assets and third, to promote sustainable livelihoods by building local infrastructure assets. While the first two objectives may be classified as short-term, the third objective is related to the long-term solution of addressing the problems of food insecurity (Devereux et al., 2006).

Unlike preceding interventions, the PSNP program has several distinguishing features. First, there is a distinction between direct support (DS) and public work (PW) beneficiaries. The former includes vulnerable but labour constrained households who receive support from the program but are not expected to provide any labour contribution, while the latter are expected to provide time and help build community assets. Second, according to MoARD (2005), natural

resource degradation in general, and soil erosion and drying up of water sources in particular, are the root causes behind declining agricultural production which eventually leads to poverty and food insecurity. Consistent with this analysis, natural resource management using soil conservation and flood control structures, together with water harvesting and water conservation projects are the most important components of the public works projects implemented under PSNP. Finally, in order to achieve its long-term objectives of creating and maintaining quality local rural infrastructure assets the programme has adopted a so-called Community Based Participatory Watershed Development (CBPWD) approach which requires active participation of the community in the overall program cycle. As is by now quite widely known, the aim of such community based development initiatives is to reverse the traditional top-down approach and allow beneficiaries (the community) to participate in all aspects of watershed development by involving them in the selection, implementation, management and maintenance of projects.

Since its inception, the PSNP has attracted a large body of empirical work. A number of these studies have evaluated the targeting efficacy of the PSNP (Nigussa and Mbrengwa, 2009); its impact on assets, food security and consumption, diversification (for example, Knippenerg and Hoddinott, 2017; Mohamed, 2017; Béné et al., 2012; Hoddinott et al., 2012; Berhane et al., 2011; Andersson et al., 2011; Gilligan et al., 2009) and its unintended but positive impact on emission of greenhouse gases (Woolf et al., 2018; Woolf et al., 2015).[1] While the results vary across studies, depending on the district and the region under scrutiny, the literature tends to suggest that the PSNP has had a positive effect on a range of outcomes, including enhancing household resilience

[1] Based on data collected from 24 PSNP districts located in six PSNP regions (Afar, Amhara, Oromia, Somali, SNNPR and Tigray), Woolf et al. (2018) estimate the emission of greenhouse gases in districts covered and not covered by the PSNP. Using summary statistics and two-sided t-tests, they find that sites covered by the PSNP emit far less greenhouse gases as compared to those without. They argue that the reduction in GHG in PSNP areas may be attributed to the soil and water conservation activities of the PSNP which have resulted in better land management and reduced land degradation.

to covariate shocks and asset accumulation.[2] Despite the large funds devoted to the creation of rural infrastructures by the program (mainly as transfer payments for the public work participants) and the wide range of studies on the program, the effect of the program and in particular its participatory approach on the quality of rural infrastructure which underpins the program's long-term objectives is still awaited although Construction of durable assets is vital for the realization of the long term objective of the PSNP.

Motivated by the long-term objective of the program and its participatory approach, the current study aims at analysing the effectiveness of community participation in determining the quality and durability, as measured by project damage and project operational status, of local public goods built through the PSNP. In particular the study provides: (i) an assessment of the extent of community participation in various project-related decisions (ii) an assessment of the condition of community assets in terms of project damage and operational status and (iii) an examination of the effect of community participation in determining the condition of assets built through the PSNP.

The paper draws on primary data collected from 249 rural projects constructed between 2005 and 2013 which are located in 53 watershed communities in four food insecure districts located in Ethiopia's Oromia region - a region where the PSNP is particularly active. Due to the

[2] Knippenberg and Hoddinott (2017) examine the effect of the PSNP on mitigating the effects of drought. Using survey data from multiple years they find that PSNP payments lead to a reduction in the initial impact of drought on food security by 57 percent and an elimination of the adverse drought impact within two years. Based on an analysis of cross section data from 160 households located in a food insecure district, Mohammed (2017) finds that the PSNP has a positive and significant effect on food consumption but no effect on income. Béné et al. (2012) use panel data from 2006 and 2008 and conclude that the effect of the PSNP is limited and not strong enough to completely protect beneficiaries against the impacts of severe shocks. Using Ethiopian Food Security Surveys (EFSSs) collected in 2006, 2008 and 2010, Hoddinott et al. (2012) conclude that household access to the PSNP and Other Food Security Programmes (OFSP) and the Household Asset Building Programme (HABP) has led to increased use of fertilizer as well as enhanced investments in agriculture. Berhane et al. (2011) compare the effect of longer term (five years) versus and short term (one year) participation in the public works programs on livestock holdings and report that longer participation raises livestock holdings by 0.38 tropical livestock units (TLU). Andersson et al. (2011) use three rounds of panel data (2002, 2005, 2007) from one of the country's regions to examine the impact of the PSNP on household holdings of livestock and trees. They find that while the PSNP has a positive impact on tree holdings there is no impact on livestock holdings. Gilligan et al. (2009) use cross-section data collected 18 months after the launch of the PSNP to examine the impact of the PSNP and other safety net programs (OSNP) on a range of household economic outcomes. They find that the PSNP on its own is not very effective but in combination with the OSNP there is a positive impact on food security, enhanced use of improved agricultural technologies, and greater probability of operating nonfarm business activities. However, there is no evidence of increased asset accumulation.

focus of the PSNP public works, attention is restricted to soil and water conservation structures. Data were collected through a field survey which included beneficiary self-assessment as well as on-site observations and assessments by soil and water conservation engineers. The surveys were augmented with qualitative data gathered using Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs).

To preview our results, we find an overall high degree of participation ranging from 72 to 83 percent across the 12 participation decisions although there were substantial variations in participation rates across the four districts. The variation in participation across districts is paralleled with variations in project outcomes whereby project damage was about 50 percent in districts in districts with relatively low levels of participation and about half that in those districts with almost complete participation. Exploring the availability of multiple projects located in the same watershed community to identify the effect of variations in community participation on variations in project outcomes within the same community, we find that community participation in project monitoring and evaluation played a substantial role in enhancing the physical and operational state of projects. Our estimates showed that the damage of projects found in areas with high participation is reduced by 50% compared to those projects found in areas which have relatively low participation

The remainder of the paper is organized as follows. Section 2 provides a review of the theory and empirical evidence on the role of community participation in development interventions. Section 3 provides details on the PSNP and its Public Works component. Section 4 outlines the data and methodology. Section 5 discusses the findings while the final section concludes.

2. Community Participation – Theory and Evidence

In the last two decades, driven by disenchantment with centralized modes of governance, waves of decentralization have occurred in countries covering half the world's population (Bardhan and

Mookherjee, 2006) and large sums of money (Mansuri and Rao, 2013) have been ploughed into poverty-alleviation projects which directly involve project beneficiaries (the community) in some or all aspects of project design, implementation and management. This trend has been motivated by the perception that a centralized government breeds corruption and rent-seeking and is unaccountable. Decentralization of control over resources and divestment of authority to local governments coupled with community participation has been offered as an approach to enhance beneficiary targeting, foster the adoption of projects that are more closely aligned to local preferences, improve service delivery and reduce corruption.[3] Notwithstanding these expectations, theoretically, there is no guarantee that such outcomes will occur (Waller et al. 2002).

Arguments in favour of decentralization and community participation centre around the role of local information in leading to more informed decisions and through the provision of agency, voice and control to project beneficiaries, a stronger link between allocation of funds and local preferences. Such control and preference matching may be expected, among other outcomes, to lead to more durable and better-maintained community assets (Finsterbusch and Van Wicklin, 1987; Mansuri and Rao, 2013:182; Nkwake et al., 2013). However, it is also possible that due to "local capture", development outcomes will continue to mirror or perhaps worsen as compared to a more centralised system as bureaucratic and political power moves downward (Platteau and Gaspart, 2003; Dasgupta and Beard, 2007).

The theoretical debates on the relative merits of decentralization and community participation have fostered a large empirical literature which has been comprehensively reviewed by Mansuri and Rao (2013). Their report focuses on three issues, namely, evidence of local elite capture, the role of participation in strengthening civil society and most pertinently for the current paper, the impact of participation on development outcomes including the quality of local

[3] While there are several flavours of community participation with different monikers and different levels of community involvement, two broad approaches are discernible. These are, Community Based Development (CBD) which refers to development projects that actively involve beneficiary communities in decisions related to design and management and Community Driven Development (CDD) which goes beyond CBD and involves communities in the allocation and management of funds (Mansuri and Rao, 2004: 1-2).

infrastructure. Compared to the range of studies on various dimensions of participation, the literature on the role of participation in determining the quality of local infrastructure is quite thin. Only a handful of studies have explored the link between participation and the quality of public works infrastructure. These include, Narayan (1995), Prokopy (2005), a pair of studies by Khwaja (2004, 2009) and Mansuri (2012).

Based on a global study of evaluation reports covering 121 rural water supply projects in 49 developing countries, Narayan (1995) concluded that overall beneficiary participation throughout the project cycle (design to maintenance) was a significant factor in ensuring overall project effectiveness and success.[4] Overall project effectiveness and success was generated by using factor analysis of twenty performance indicators. The analysis was based on cross-section data and relied on multivariate regression analysis using a score of participation (one indicating zero participation and seven indicating high participation in decision making as well as control of resources) as the main explanatory variable. The quantitative analysis was combined with systematic qualitative analysis of some selected cases. Although the study is innovative in terms of attempting to examine the effect of participation on project outcomes, the paper's use of factor analysis and an overall measure of participation makes it impossible to identify the effect of a specific participation decisions on a specific project outcome.

Building on Narayan (1995), Prokopy (2005) explored the relationship between five project outcomes and two measures of participation - beneficiary contribution to the capital cost of projects and household involvement in decision making.[5] Based on cross-section data collected from World Bank assisted water supply and sanitation projects in 45 villages in two Indian states,

[4] The projects were established by eighteen different agencies located in Asia, Africa and Latin America. The evaluation reports for the study report were based on impact assessments carried out by experienced evaluators.

[5] The five outcome variables are the percentage of households (i) reporting satisfaction with the new project (ii) that have paid tariffs (iii) stated that access to water is more equal (iv) reporting time savings (v) who think that the village can sustain the system for 10 years. The participation variables are the percentage of households that have contributed to the capital cost of the project and household involvement in decision making who are aware of project prior to its construction, attended planning meeting, participated in more than one decision, supervised construction work, attended post construction meeting and the percentage of households that have contributed to the project cost.

the author showed that both measures of participation significantly enhance three out of the five outcomes (village level satisfaction, equal access to water and time savings) based on which the author recommends encouraging both measures of participation. The author admits the existence of reverse causality between participation and project outcomes and attempts to address this concern by using pre-project participation measures. However, four of the five outcomes remain susceptible to reverse causation. Furthermore, the outcomes used in the paper are mainly subjective.

Based on cross-section data analysis of 132 infrastructure projects in 99 rural communities located in Northern Pakistan, Khwaja (2004, 2009)[6] finds that projects constructed by the government, which implies lower levels of participation, have a maintenance score which is 23.6 percentage points lower (implying maintenance is less likely to have been carried out) than NGO-initiated projects. Highlighting the importance of community capacity, the paper finds that communities are better able to maintain projects that are less complex and which are being refurbished as compared to new projects. An interesting twist is the finding that community participation in non-technical decisions is associated with a 55 percentage point increase in maintenance score while greater community participation in technical decisions is associated with a 39 percentage point reduction in the maintenance score. The author also finds that there is a U-shaped relationship between greater inequality in project returns and maintenance. That is, as inequality increases there is a decline in the extent to which project maintenance needs are met but increases beyond a certain threshold as high levels of inequality indicate that the project has effectively been privatized.

Mansuri (2012) extends Khwaja's work by examining the link between community participation and project outcome quality using cross-section data on 230 infrastructure projects located in 80 villages in three of Pakistan's largest provinces. Half the projects in the sample were

[6] The 2009 study includes only 64 of the projects located in 33 communities in Baltistan North Pakistan.

constructed through Pakistan's National Rural Support Program (NRSP), which adopts a participatory approach, while the remainder were constructed by the concerned government departments. Design and construction, and current condition and maintenance are the main outcomes assessed in the study. Mansuri (2012) finds that participatory projects are better designed and constructed as compared to projects constructed without substantial community participation. Similar to Khwaja (2009), the study finds that such projects are also better maintained. The paper argues that this may be due to NRSP's approach to project maintenance where such costs are included as part of project costs at the proposal stage although the community is responsible for project maintenance. On a negative note, Mansuri (2012) finds that the distribution of project benefits is not sensitive to project type and regardless of whether a project has been constructed through the NRSP or government line departments, the share of marginalized groups in accessing project benefits is far less than their share in the population.

A recent narrative synthesis of the effect of community-driven development (CDD) projects on various outcomes including the quantity and quality of infrastructure is provided by White et al. (2018).[7] A unique element is that the report draws on the grey literature and compiles evidence from program documents, process evaluations and qualitative research papers. The authors conclude that CDD projects have led to substantial increases in the quantity of small-scale infrastructure although in terms of their (technical) quality, the evidence is mixed and varies across countries. Similarly, effects on most welfare outcomes (health, education) are insignificant except in the case of the effect of improved water supply on time savings.

While the studies discussed above look directly at the effect of community participation on project outcomes, a point emerging from these studies is a community's capacity in maintaining project quality. A related strand of the literature examines this aspect directly and concludes that the inability of communities to maintain projects is not an indictment of the participatory approach

[7] The study is based on 25 impact evaluations of 23 programmes implemented in 21 low and middle income countries.

but a failure to provide adequate post-construction financial and technical support. For instance, based on their global review of water projects, Katz and Sara (1997) argue that inadequate technical support is one of the main reasons for project failure. Isham and Kähkönen (2002) reach a similar conclusion on the basis of their analysis of water projects in India, Indonesia and Sri Lanka. Echoing this conclusion, in their impact evaluation of the Bolivian social find, Newman et al. (2002) find that water projects were associated with increases in water quality only if communities also received training. An interesting study which examines the long-term sustainability of participatory rural water pipeline schemes in Malawi is provided by Kleemeier (2000). Based on an examination of 12 schemes which were constructed 3 to 26 years prior to the time she conducted her analysis, Kleemeier finds that about half the schemes are not functioning well. She goes on to conclude that participatory community organizations are capable of managing relatively small schemes, but do not have the technical and management capacity to handle larger schemes. Although not explicit, in their review, White et al. (2018) do not indict the CDD approach but suggest that the poor quality of infrastructure projects may be attributed to poor supervision, poorly qualified contractors and engineers and insufficient capacity of implementing agencies.

As far as the PSNP program is concerned, soon after its commencement the Government of Ethiopia (2006) conducted a review of the public works program. While the report pointed out variations in project quality perhaps linked to differences in implementation capacity, the main conclusion was that most projects implemented through the PSNP, especially roads, irrigation and water supply projects, have failed to meet minimum technical standards. While there have been no attempts to examine the impact of these projects on economic outcomes, in their review of social protection programs in Ethiopia, Devereux and Guenther (2009) expect that the economic impact of such PSNP constructed assets is likely to be negligible. It is likely that the limited attention paid to the quality of public works in the initial years of the programme may have been driven by an immediate focus on other program objectives. In any case, a necessary condition for project returns is adequate project quality and maintenance which in turn calls for an investigation of

whether the community-based approach used in the PSNP program has any bearing on such outcomes.

3. The Productive Safety Net Program – A Brief Overview

The PSNP program, which operates in food insecure districts of the country, has been operating since January 2005 and is currently in its third phase (2015/16 – 2019/20).[8] This phase builds on the efforts of the first and second phase and stresses the achievement of the program's objectives by forging links between the PSNP and other food security programs (MoARD, 2010). Currently, the programme covers 319 food insecure districts or about 40 percent of the country's districts (MoA, 2014; Woolf et al., 2018, UNICEF, 2016). The main objectives of the program remain unchanged and the focus is on shifting the trend from meeting short term food needs through emergency relief, to addressing the underlying causes of food insecurity. As discussed by Devereux and Guenther (2009), the three main objectives are to protect households by providing resources to smooth consumption during the dry season, protect households by preventing sales of household assets and reduce the probability of borrowing and finally promote livelihoods by building community assets with development potential. In 2013/14, the year before the data for this study was collected, the program had a cash budget of about $205 million and access to food resources to the tune of 274,844 metric tonnes and provided social transfers to about 6 million food insecure individuals either through "public works" activities (4.8 million) or as "direct support" (1.2 million) for labor constrained households (MoA 2013).

Beneficiaries of the public work component are expected to undertake public works activities in six major areas – these are, soil and water conservation/water harvesting, construction of rural feeder roads, bridges and fords, water supply for animal and human use, creation of social infrastructure (schools, health and animal posts), small scale irrigation activities, and agricultural

[8] A district is classified as food insecure on the basis of the frequency of requiring food assistance in the ten years preceding 2004. Food insecure households within such districts are households who fail to produce enough to meet their consumption needs even when there is normal rainfall (MoARD, 2010: 8).

activities related to composting and farmers training. Among these categories, soil and water conservation/water harvesting is the dominant activity and accounts for more than 70 percent of the total public works projects in most districts (MoARD, 2010). Project beneficiaries are expected to be involved in all elements of the public works project cycle.

The overall approach is called Community Based Participatory Watershed Development (CBPWD) and the overarching objective of the participatory model is: "…to generate greater cohesion within the society and enable its poorest members to benefit from the various assets created and eventually to overcome their food insecurity". The project implementation manual contains a detailed guide on the steps that need to be followed to ensure community involvement from project inception, to implementation and maintenance. Based on the CBPWD guidelines each watershed needs to form a Community Watershed Development Committee (CWSDC) and watershed residents need to participate in various activities. Based on the manual, four major categories of participation may be identified. These four participation categories are participation in planning and implementation; project usage and benefit distribution; maintenance; project monitoring and evaluation. Within each of these broad categories there are several sub-categories and beneficiaries are expected to play a role in determining each of these outcomes. As is discussed in the next section, the data collection efforts were guided by the CBPWD and attempted to measure community participation in each of the four broad categories as well as various sub-categories.

4. Data and Empirical Approach

4.1 Data

The study relies on data collected between August 2014 and January 2015 from four food insecure districts (Yabello, Kuyu, Arsi Negelle and Doba) located in Ethiopia's Oromia region.[9] Of the 319

[9] The PSNP is very active in the region. The region accounts for close to 21 percent of all PSNP project beneficiaries.

districts where the PSNP operates, 25 percent are located in this region.[10] These 79 PSNP districts may be divided into three agro ecological climatic zones, that is, low altitude *(kola*), mid altitude (*woynadega*) and high altitude (*dega*). Some districts have features of all three agro-climatic zones. The three climatic zones (low, mid, high) account for about 30, 34 and 7 districts, respectively, of the total PSNP districts in the region while the remaining 8 consists of districts with mixed features. In order to ensure representation of each agro-ecology in the sample, one district was randomly selected from each of the three climatic zones.[11] In addition a fourth district which has mixed features was also selected. Map 1 indicates the location of the four sample districts. Given the predominance of natural resource - soil and water conservation/harvesting projects in the PSNP's portfolio, data collection was restricted to these two project categories.[12]

Subsequently, due to financial and logistical reasons, we decided to collect data from 20 percent or 17 of the 84 PSNP villages located in the four randomly chosen districts. Based on the share of each district in the total number of PSNP villages we selected 4, 3, 4 and 6 villages to be surveyed from Yabello, Arsi Negelle, Kuyu, and Doba districts, respectively. Within each village, based on the share of person days allocated for soil and water projects, we planned to gather information on about 15 (in the case of Kuyu and Yabello) and 20 (in the case of Arsi Negelle and Doba) soil and water conservation projects per village with an overall plan of covering 295 structures in the four districts. Due to logistical challenges the target could not be reached and the study is based on surveying 249 projects located in 17 villages spread over 53 watershed communities. The number of households residing in a watershed ranges between a minimum of 15 to a maximum of 300.

[10] The figures are based on the 2013/14 program data.

[11] Yabello was randomly selected from a group of thirty predominantly low altitude districts, Arsi Negelle from a group of thirty four predominantly mid-altitude districts while Kuyu was picked from a group of seven predominantly high altitude districts. Doba belongs to the group of eight districts with mixed features.

[12] Across the four districts, on average, soil and water conservation projects account for 73 percent of the annual person days spent on public works activities. In the four sample districts, the figure ranges from with a minimum of 65 percent in the case of Kuyu to a maximum of 79 percent in the case of Doba.

Given the nature of the public works, two types of questionnaires were administered. The first, a collective questionnaire, was administered to a so-called Structure Response Group (SRG) which consisted of four to six beneficiaries. A total of 1,238 individuals participated in the 249 SRG.[13] To be part of the SRG, an individual had to be a resident of the watershed community and a participant in the public works program. Individuals were randomly selected from a list of public works beneficiaries available at the watershed community level and randomly assigned to a structure response group. The SRG questionnaire gathered information on watershed community traits (number of households in the watershed, access to public facilities) project characteristics (type, age, new or refurbished), formation of the CWSDC and information on current operational and physical status of the project. Immediately after the collective survey, an individual-level survey was administered to each of the SRG participants. This survey was used to gather information on the main explanatory variable, community participation – defined as whether the household or its members have participated in twelve project decisions. Consistent with the guidelines in the CBPWD these decisions were categorized into four major types of participation – planning and implementation, project usage and benefit distribution, maintenance, and monitoring and evaluation. In addition, the individual survey gathered information on individual and household characteristics, perceptions of PSNP and CBPWD and existing social interactions between and within watershed communities.

The responses of the SRG on the operational and physical status of individual projects were supplemented by a technical survey conducted by soil and water conservation engineers. These six engineers, each with more than six years of experience with the technical guidelines prescribed in the CBPWD manuals and the author visited each of the projects and measured their condition in terms of their physical condition and operational status.

[13] Of these 1,238 individuals, 52% were female. Except for 21 groups (8%), all the SRGs have at least one female member. With regard to age, 67% of the respondents were between the ages of 30 and 50 followed by 20% with above 50 years of age and 13% were between the ages of 16 and above but less than 30 years.

The qualitative data collection included eight Key Informant Interviews (KII) – two in each district and one focus group discussion (FGD) in each of the 17 villages (kebeles) where the SRG and individual surveys were administered.[14] The discussions and interviews revolved around the implementation of the public works component of the PSNP, views on the relationship between the administrative officials and beneficiaries, reasons for participation or non-participation in public works project decisions.

4.2 Empirical approach

A necessary condition for the PSNP to be part of a solution to the country's food security concerns is that infrastructure projects built through the program should be of adequate quality. Construction of durable assets is vital for the realization of the long term objective of the PSNP. Consistent with this line of argument, the main outcome variable used in this paper is the extent of a project's physical damage as determined by on-site visits conducted by engineers. While it is subjective, we also use information provided by the engineers on the functional status of a project.

Physical condition was rated on a 5 point scale ranging from undamaged to severely damaged as well as in terms of the percentage of a project that was damaged.[15] Engineers provided estimates in terms of the percentage of a project that was damaged and a response based on the 5 point scale while the SRG provided an estimated based only on a 5 point scale. Operational status was defined in terms of a 3 point scale (fully operational, partially operational, non-operational) and is a measure of the extent to which a project is meeting the purpose for which it is intended. Accordingly, we treat the two outcome variables (Y) for project i located in watershed community

[14] The key informants were usually heads of the agriculture office and village administrators or their representatives.
[15] The damage percentage variable is based on the extent of project damage. For instance, if there is a five meter long stone bund and about 1 meter is damaged then the damage percentage is recorded as 20 percent. Operational status provides an idea of the project's capacity to generate the expected benefits. The role of a stone bund is to provide protection against soil erosion and operational state is defined in relation to how well the project is performing in terms of preventing soil erosion.

j as a function of, project characteristics (*P*) and community participation in project decisions (*Part*), ε_{ij} is an unobserved error term. That is,

$$Y_{ij} = \lambda + P_{ij}\eta + Part_{ij}\mu + \varepsilon_{ij} \quad (1)$$

P_{ij} includes project specific characteristics such as project type (soil conservation/water harvesting), age, mode of construction, that is, completely new or extension of an existing project). $Part_{ij}$ in (1) includes four measures of participation – that is, participation in planning and implementation, project usage and benefit distribution, maintenance, and monitoring and evaluation. Each of these four measures indicate the share of households in a structure response group that participated in each of the participation decisions.[16] Although not shown in (1), the specification also contains a set of four district dummies.

Several concerns may arise while using (1) to estimate the effect of participation on outcomes. First, it is possible that communities with certain unobserved traits, for instance, greater social cohesion may be more likely to participate. At the same time social cohesion may also influence project outcomes, that is $Cov\ (Part_{ij}, \varepsilon_{ij}) \neq 0$, and hence OLS estimates of (1) are likely to be biased. Second, (1) treats project outcomes as a function of participation. However, the reverse, that is, participation itself maybe a function of project outcomes cannot be ruled out. For example, if a project is well constructed and yields clear benefits this in turn may lead to greater community participation in deciding how project benefits should be distributed and/or how a project should be maintained.

In order to deal with the first issue, in addition to estimating (1) which includes various community traits to absorb differences across communities, we estimate a model which includes watershed community-fixed effects and explore variation in participation within a watershed community to identify effects. This is possible as in most of the watershed communities in the

[16] For instance, if there are five members in a structure response group and three indicated that they participated in a planning decision, then participation in that decision is 60%. In the first instance, participation in each of twelve project decisions was computed in the manner just described and then s aggregated into four participation decisions.

survey there are multiple projects (49 of 53 communities) and this enables us to use variation in participation within the same watershed community to isolate the effect of participation on outcomes (see Figures 1 and 2). That is, we estimate,

$$Y_{ij} = \lambda + P_{ij}\eta + Part_{ij}\mu + \theta_j + \varepsilon_{ij} \quad (2)$$

where θ_j is a watershed community fixed effect.

To deal with the second issue we divide the measures of participation into those elements of participation that occur before project benefits start to flow, that is, participation in project planning and implementation and those that occur after the flow of project benefits. While the latter measures of participation are more likely to be influenced by reverse causality, for the former, this is unlikely. We estimate several variants of (1) and (2).

5. Results

5.1 Descriptive statistics – project damage and participation

Tables 1 to 5 provide summary statistics of the variables used in the analysis. As displayed in Table 1, according to the engineers, the average project damage is 37% and about 55% of the projects are fully operational and generate the expected benefits. The average project is about 4.9 years old and 63 percent of the projects are meant for soil conservation. About half the projects are extensions to existing projects while the remainder are completely new. Table 2 examines the link between a project's physical status and its functional state. The bulk of the highly damaged projects are not functioning (72 of 77). However, there is more variation in the other categories. Of the 76 projects that show very low levels of damage, 21 are not functioning. While this is surprising, the explanation provided by the engineers was that these projects are not badly damaged but they have operated long enough and are no longer yielding the expected benefits.

Community participation in different decisions and sub-decisions is quite high. As shown in Table 3, across the 12 decisions, participation ranges from 72 to 83 percent. Of a total of 1,238

households, 71 percent have participated in all four decisions at the planning stage. The corresponding figures are 73, 71 and 78 percent for decisions relating to project usage and benefit distribution, project maintenance, and project monitoring and evaluation respectively (Table 4).[17] Breaking down the participation decisions into those that take place after and before project execution (Table 5) shows that 68 percent of the respondents participated in all eight post-project execution decisions while the figure is 71 percent for participation before project execution. The lack of substantial differences in participation rates before and after project execution suggests that participation is not driven by actual receipt of benefits. If this were the case then one would expect to find differences in participation rates before and after the project.

Table 6 delves deeper and examines district-specific patterns in project damage, project functional status, participation in project decisions and formation of the CWSDC. Project damage is substantially higher, a little above 50 percent, in two of the districts (Kuyu and Arsi Negelle) as compared to the lower rates of damage in Doba (25.4%) and Yabello (37%). In terms of the operational status, 60% of the projects in Yabello are in good functional state as compared to a little below 50 percent in Kuyu. A little more than half the projects (54%) in Arsi Negelle and Doba have good functionality. There is marked variation in participation across districts. Almost all households participate in decision making across the 12 project decisions in Doba. Participation rates in Yabello are also high and range from a low of 75% to a high of 96%. In contrast, rates of participation in the other two districts are substantially lower and lie between 12% and 60% in Kuyu and between 51% and 75% in Arsi Negelle.[18] Despite this marked differences in project decision making committee watershed committees have been formed in almost all locations. These

[17] See Table 2 for details of numbers and types of decisions falling under each category.

[18] Marginal effects based on ordered probit estimates of participation in different stages of the project cycle while controlling for other factors yields the same message, that is, there is substantial variation in participation across the four districts (see Table A14 on participation in planning decisions). With the exception of education and duration of membership, full participation in project decisions does not seem to depend on respondent's individual characteristics. This implies that selection of individuals to our sample was purely random.

patterns indicate that the presence of a committee does not automatically translate into participation.

Qualitative information obtained from Focus Group Discussants underlines these district-specific differences. A female FGD participant from Doba narrated:

> "I am a PSNP public works beneficiary from the start. Initially we just did what we were told to do by the officials but in the last few years things have changed. We received different trainings including technical trainings and we take the lead. We first gather and discuss what to do for the year and we prioritize based on the allocated person days we get every year. We work closely with the development agents and even with those working at the woreda agricultural office." (Discussed in December 2014).

The reflection from a discussant in one of the villages in Kuyu echoes the opposite:

> "…our participation in the public works is limited to doing what we are told to do by village officials. They tell us what activities we have to do, where and when to do it. Although we get transfers for six months in the year, we are called for different activities at any time of the year even outside the PWs implementation timing. We just follow their order since we do not want to risk [being] taken out of the program." (Discussed in September 2014).

Information obtained from district level key informants also substantiates the differences found in the survey data. For instance, while discussing project participation, a district level key informant in Doba remarked:

> "…the follow-up of beneficiaries on the PW projects is incredible. They do beyond what is expected as a PW beneficiary. They do see the benefit of their work and their work is acknowledged at different levels and it keeps them motivated" (Interviewed on December 2014).

The perception by a key informant in Kuyu is quite different. While commenting on project participation the informant noted:

> "…the public works participants in this village are not enthusiastic about their activities. They work just to fulfil their paid person days and not very caring about the quality of the infrastructure. There were times they left off uncompleted [SWC] structures just because they completed their person days." [Interviewed September 2014]

Overall, there are clear differences in community participation across districts and *prima facie* it seems that project participation and project damage are correlated. The next section provides a more formal exploration of this link.

5.2 Participation and project outcomes

5.2.1 Project damage and participation

A graphical exploration of the relationship based on locally weighted regressions between each of the participation measures and project damage is displayed in Figure 3. Across all the four decisions, increasing participation is clearly associated with a decline in project damage. Table 7 presents a series of estimates of equation 1 with each of the four participation measures included sequentially, followed by a specification which includes all the measures. Individually, each of the participation measures is negatively associated with project damage but not statistically significant. Focusing on the most complete specification, two out of the four participation measures are negatively associated with project damage and the effect of participation in project monitoring and evaluation is statistically significant at the 5 percent level. The lack of precision in project usage and benefit distribution is not unexpected as participation in the various project decisions is highly correlated (see Table A2). Nevertheless, what is clear is that a 10 percentage points increase in community participation in project monitoring and evaluation is associated with about a 2 percentage points reduction in project damage. There are clear differences across districts with projects in Doba about 19 percentage points less likely to be damaged as compared to projects in other districts. The positive effect of participation in project monitoring and evaluation on project damage after controlling for district effects indicates that overall variations in project damage and project participation are not driven only by differences across districts but also by variation within districts

Table 8 provides estimates of equation 2. This specification controls for watershed community effects and exploits variation within the 49 watershed communities, where there are multiple projects, to identify the effect of participation on project damage. The advantage of such a specification is that the effect of participation on project damage is not contaminated by differences in characteristics across watershed (or district) communities in characteristics such as community leadership or community capacity. Similar to the results in Table 7, each of the

individual measures of participation is negatively related to project damage although only participation in project monitoring and evaluation is statistically significant again at the 5 percent level. Based on the specification that includes the participation measures simultaneously shows that participation in monitoring and evaluation decisions is associated with a reduction in project damage. In terms of magnitude, a 10 percentage points increase in participation is associated with a 3.1 percentage points reduction in project damage.

These estimates indicate that if a watershed found in a district with low participation were to enhance participation in monitoring and evaluation to a high level – say from 57 percent in Kuyu to the level of participation in Doba (95%) – then project damage would decline by 12 percent or about 50 percent of the gap in project damage between the two districts may be attributed to differences in participation in monitoring and evaluation. These are large effects.

Elaborating on the record of high participation and better project outcome, an FGD participant from (Lega Lencha village) in Doba district narrates his case:

> "We [The beneficiaries] were not really in to the projects the way we are now. We didn't follow the structures and just come only for the sake of attendance. Thanks to a former district level agriculture office head who changed the district's picture completely. What he did was he selected some PW beneficiaries (including myself) from different villages in the district and sent us on an experience sharing visit to a village called Abraha Wa Atsbha in Tigray region which at the time had an outstanding performance on SWC. It was like 'Heaven in the middle of Hell!' Everything was green, fresh wind blowing and plantation on the revived land throughout. PW beneficiaries of the village shared their experience and trained us on building and maintaining SWC structures. We came back to our village with a different attitude towards the SWC structures. We took our turn of sharing what we saw and training other beneficiaries who did not get the chance of going there. Although the performance is not similar across the villages in Doba, we are proud that we are among the top performing districts in the region as well as the country. We now go to different PSNP districts all over the country to train others and others also come to our district to share our experience and get 'peer-to-peer' training." [Discussed in December 2014]

Another participant of FGD in Dherito village in Yabello district discusses:

> "We learnt our lesson the hard way. In the previous regimes, our zone [Borena] was known for its huge livestock production. At the time we did not care much about the environment (soil and water degradation with its consequence on our small farming and animal fodder). We woke up very late but we are now trying our best to benefit as much as we can from the SWC structures. It is different when you learn it the hard way. You become result focused and concerned about the activities."[Discussed in November, 2014]

5.2.2 Project operational state and participation

Table 9 provides estimates of the effect of participation but this time with a project's operational status as the outcome variable. This variable is constructed as a binary variable which indicates whether the project is functioning well or not (includes partially and no-operational). As shown in Column 5 of the Table, once again, increase in community participation in project use and benefit distribution, and project monitoring and evaluation decisions increase the probability that a project is functioning well. The estimates from a linear probability model controlling for community watershed fixed effects in Table 10 yield a similar positive effect of participation in project monitoring and evaluation on a project's functional state. The positive, and relatively sharp, effect of participation in project monitoring and evaluation is also captured in Figure 4 which explores the bivariate relationship between project functional state and participation based on a locally weighted regression.

6. Discussion and concluding remarks

This study was motivated by the limited evidence on the quality of rural infrastructure built through public works based social safety nets. While such programs have been rolled out in a number of countries, the contribution of such programs to the creation of rural infrastructure which is expected to serve as basis for rural development and food security has not attracted much systematic scrutiny. Indeed, maintaining the quality and durability of such rural infrastructure is a costly problem for developing countries.

This study, which was based on Ethiopia's Productive Safety Net Program, examined the effect of the program's community-based approach in determining the quality of rural assets. The study was based on a sample of 249 Soil and Water Conservation (SWC) projects located in 53 watershed communities in four food insecure districts in Oromia region and dealt with three aspects. First, the paper analyzed the degree of community participation in project decision making. Second, the paper used soil and water conservation engineers to provide a technical

assessment of the projects in terms of their project damage and whether they were fully operational. Third, the paper examined the role of community participation in influencing project outcomes.

We found a high degree of participation ranging from 72 to 83 percent across 12 participation decisions. Despite the overall high rate of participation, there were substantial variations in participation rates across the four districts. Paralleling the variation in participation, project damage was about 50 percent in districts with relatively low levels of participation and about half that in areas with almost complete participation. We were able to exploit the availability of multiple projects located in the same watershed community to identify the effect of variations in community participation on variations in project outcomes within the same community. This yields a more credible estimate of the effect of participation on outcomes as compared to approaches which rely on variations across communities to identify the effect of participation. We found that community participation in project monitoring and evaluation played a substantial role in enhancing the physical and operational state of projects. The estimates indicated that increasing community involvement in areas which have relatively low participation rates (57%) to the rate observed in areas with high participation (95%) maybe expected to reduce project damage by 50%. This is a large effect and shows that good design features, in this case, participation plays a strong role in ensuring the durability of PSNP-built infrastructure.

Notwithstanding these effects and the use of variations within a watershed to achieve identification, it is possible that it is the flow of project benefits, say a well-functioning project that enhances participation and not only that participation leads to better project outcomes. The paper also did not consider what drives project participation. Nevertheless, the results in this paper provide supporting evidence to the argument that increasing community participation in project decision is associated with more durable rural infrastructure and that at least in the Ethiopian case this particular design feature of the PSNP is worth implementing.

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Tables

Table 1
Description of variables: SRG level

Variable	Definition	Mean (std. dev.)
Project outcomes		
Project Damage (%)	Share of project that is damaged	37.12 (28.14)
Project operational state	Fully operational = 1	0.55
Project characteristics		
Project make	Project is new or an extension, new =1	0.50
Project type	Soil conservation projects=1	0.63
Project age (years)	Number of years since project constructed	4.88 (2.15)
Community watershed characteristics		
Distance from the district town (km)	Distance of watershed from nearest (large) district town	19.97 (10.70)
School availability	Is there a primary/junior (secondary) school in the watershed, Yes = 1	0.41
Access to water	Does the watershed have facility for potable water, Yes = 1	0.31
Access to electricity	Does the watershed have access to electricity, Yes = 1	0.09
Access to health facility	Does the watershed have health center/facilities, Yes =1	0.23
Cultivable land size (hectares)	Total cultivable land size for all households in the watershed area	171.9 (127.9)
District		
Yabello	The district where the project is located	0.22
Kuyu		0.18
Arsi Negelle		0.18
Doba		0.42

Notes: N = 249

Table 2
Project operational state and damage state – Engineer provided

	Damage state			**Total**
Operational state	Highly damaged (>50 %)	Slight damage (25-50 %)	Very little/ undamaged (0-25%)	
Functioning	5	75	55	135
Not functioning	72	20	21	113
Total	77	95	76	248

Table 3
Description of variables and Means (Std. Dev.): Individual level

Participation in planning	Response takes a value of 1, if a household or its members	**0.79**
Project type selection	have participated in decision making in each of these 12	0.77
Project site selection	individual participation questions	0.81
Project scale (length, capacity)		0.77
Project timing		0.83
Project usage and benefit distribution		**0.77**
Project usage rules		0.78
Nature of sanctions on misuse		0.77
Benefits distribution		0.75
Maintenance		**0.77**
Maintenance system, rules and policy		0.76
Maintenance labor contribution		0.83
Sanctions for failure to contribute		0.72
Maintenance		**0.80**
Project monitoring activities		0.79
Evaluation of the program		0.81
Respondent's traits		
Female	Respondent is female	0.52
Age	Respondent's age in complete years	42.5 (12.9)
Religion	Respondent's religion, 1=Non-Muslim	0.43
Education level	Education level of the respondent	
No education		0.75
Primary education		0.23
Secondary and above education		0.02
Household size	Number of family members	6.2 (2.1)
Female headed household	Head of the household is female, Yes = 1	0.26
Duration of membership	Number of years in the PSNP	2.9 (2.1)
Perception of PSNP & CBPWD		
PSNP addresses food insecurity	Do your trust that PSNP addresses your food security problems, Yes = 1	0.95
PSNP well targeted	Do your think that PSNP is properly targeted (no problem in inclusion/exclusion), Yes = 1	0.88
Aware of CBPWD	Are you aware of the CBPWD approach of the PSNP program, Yes = 1	0.24
Social Interactions		
Trust PSNP members	Do you trust PSNP beneficiaries more than non-beneficiaries? 1=Yes	0.18
Conflict between watershed communities	Have you ever experienced conflict/disagreement with regard to people living in different watershed? Yes = 1	0.01
Conflict within watershed communities	Have you ever experienced conflict/disagreement with people living in the same watershed, Yes =1	0.03

Notes: N=1,238

Table 4
Community participation in project decisions

Number of Decisions	Project Planning	Project Usage & Benefit Distribution	Project Maintenance	Project Monitoring & Evaluation
0	159 (12.9)	234 (18.9)	178 (14.7)	219 (17.7)
1	57 (4.6)	63 (5.1)	104 (8.6)	53 (4.3)
2	70 (5.7)	33 (2.7)	68 (5.6)	962 (78)
3	75 (6.1)	907 (73.3)	862 (71.1)	-
4	872 (70.7)	-	-	-

N (%)

Table 5
Community participation: Before and after project execution

Number of Decisions	Before	After
0	159 (12.9)	102 (8.4)
1	57 (4.6)	95 (7.9)
2	70 (5.7)	36 (3.0)
3	75 (6.1)	26 (2.2)
4	872 (70.7)	16 (1.3)
5	-	21 (1.7)
6	-	28 (2.3)
7	-	65 (5.4)
8	-	820 (67.8)

N (%)

Table 6
Project outcomes and participation in project decisions by district

Project decision	District								Overall	
	Yabello		Kuyu		Arsi Negelle		Doba			
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Project outcomes										
Project damage	36.8	82.2	50.8	27.1	50.5	29.2	25.4	25.8	37.1	28.1
Project functional status (1=functional)	0.61		0.49		0.54		0.54		0.55	
Participation in project decision										
Before project implementation (*planning*) decisions (%)	**84.95**	**24.70**	**48.53**	**25.05**	**62.93**	**35.89**	**96.55**	**10.96**	**79.14**	**29.64**
Project type selection decision	75.18	33.36	44.89	29.89	61.74	38.83	97.88	7.84	76.70	33.31
Project site selection decision	87.54	26.48	49.67	31.12	65.22	36.86	97.69	8.95	80.81	30.85
Project scale selection decision	87.68	24.99	39.11	33.02	60.27	38.09	94.42	18.37	76.64	34.57
Project time frame selection decision	89.39	24.21	60.44	36.30	64.56	36.62	96.22	12.00	82.42	29.99
After project implementation decisions (%)	**89.21**	**20.58**	**39.54**	**31.53**	**57.44**	**37.93**	**97.66**	**7.63**	**77.89**	**32.99**
Use & Benefit Distribution decisions **(%)**	**89.66**	**22.12**	**31.11**	**37.69**	**57.21**	**38.72**	**98.74**	**5.61**	**76.88**	**36.46**
Project usage decision	91.88	18.91	37.33	39.68	56.30	41.81	98.85	6.39	78.28	36.03
Nature of sanctions for project misuse decision	88.01	25.32	29.33	37.32	62.61	36.90	98.72	5.45	77.24	36.34
Distribution of project benefit decision	89.10	24.88	26.67	40.68	52.72	42.58	98.85	6.64	75.11	39.60
Maintenance of project decisions **(%)**	**86.08**	**25.68**	**30.18**	**24.87**	**63.37**	**36.24**	**98.76**	**6.21**	**77.08**	**33.97**
Maintenance system, policy and rules	85.97	25.56	28.89	40.13	57.83	42.00	98.72	6.64	75.78	38.28
Labor contribution for maintenance decision	88.32	23.66	49.33	41.69	75.33	35.12	98.72	6.64	83.21	31.57
Nature of sanctions for failure to contribute in project maintenance	83.97	30.03	12.33	24.37	56.96	42.58	98.85	6.12	72.25	40.79
Project monitoring and evaluation **(%)**	**91.88**	**16.91**	**57.33**	**42.34**	**51.74**	**43.27**	**95.48**	**14.54**	**79.72**	**34.34**
Time-to-time project monitoring	88.17	24.79	54.89	43.52	52.61	43.69	95.10	15.64	78.48	35.73
Evaluation of project effectiveness	95.58	12.18	59.78	44.13	50.87	43.35	95.86	14.05	80.97	34.49
Community Watershed Committee Formed (1=Yes)	**0.83**		**0.80**		**0.93**		**0.92**		**0.88**	
Observations	54		45		46		104		249	

Notes: The participation variables indicate the share of group members who participated in a particular decision.

Table 7
Project damage and participation – district fixed effects

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Planning	-0.12				0.12
	(0.06)				(0.18)
Project use & benefit distribution.		-0.15			-0.22
		(0.14)			(0.21)
Project maintenance			-0.12		0.21
			(0.16)		(0.25)
Monitoring and evaluation				-0.15	-0.20**
				(0.08)	(0.06)
Kuyu	5.10**	0.37	2.50	4.41***	5.56
	(1.06)	(5.95)	(6.66)	(0.37)	(7.89)
Arsi Negelle	10.11***	7.87	10.08**	6.64*	4.76
	(1.12)	(3.76)	(3.04)	(2.64)	(2.76)
Doba	-15.31**	-15.60*	-15.45*	-16.32**	-18.55**
	(4.50)	(4.96)	(5.77)	(4.21)	(5.21)
Constant	58.51***	62.06***	58.74**	62.56***	60.03***
	(7.50)	(9.78)	(11.07)	(8.42)	(12.45)
Observations	243	243	243	243	243
Adj-Rsq	0.175	0.183	0.174	0.189	0.188

Notes: District clustered robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; All specifications control for project specific characteristics (age, make and type).

Table 8
Project damage and participation – watershed community fixed effects

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Planning	-0.110				-0.019
	(0.097)				(0.143)
Project use & benefit distribution		-0.061			0.100
		(0.089)			(0.156)
Project maintenance			-0.052		0.108
			(0.081)		(0.154)
Monitoring and evaluation				-0.186**	-0.306**
				(0.084)	(0.151)
Constant	50.60***	47.40***	46.69***	55.65***	50.32***
	(9.67)	(9.88)	(9.85)	(8.28)	(9.75)
Observations	240	240	240	240	240
Adj-Rsq	0.183	0.178	0.177	0.197	0.192

Notes: Watershed clustered robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; All specifications control for watershed fixed effects and project specific characteristics (age, make and type).

Table 9
Project functional state and participation

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Planning	0.0006				-0.0038
	(0.0005)				(0.0029)
Project use & benefit distribution		0.0018			0.0056
		(0.0021)			(0.0030)
Project maintenance			0.0007		-0.0054
			(0.0019)		(0.0027)
Monitoring and evaluation				0.0017	0.0035
				(0.0014)	(0.0017)
Kuyu	0.0061	0.0899	0.0268	0.0368	-0.0117
	(0.0432)	(0.0960)	(0.0815)	(0.0335)	(0.0502)
Arsi Negelle	-0.0429**	0.0020	-0.0398	0.0952	0.0601
	(0.0118)	(0.0544)	(0.0278)	(0.0397)	(0.0382)
Doba	0.0948	0.0857	0.0936	0.0952	0.1631*
	(0.0778)	(0.0873)	(0.0929)	(0.0757)	(0.0618)
Observations	243	243	243	243	243
Adj-Rsq	0.015	0.022	0.015	0.023	0.033

Notes: District clustered robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; All specifications control for project specific characteristics.

Table 10
Project functional state and participation

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Planning	-0.0001				-0.002
	(0.002)				(0.003)
Project use & benefit distribution		0.0002			0.003
		(0.002)			(0.004)
Project maintenance			-0.001		-0.005
			(0.002)		(0.003)
Monitoring and evaluation				0.002	0.005**
				(0.002)	(0.002)
Observations	240	240	240	240	240
Adj-Rsq	0.030	0.030	0.031	0.034	0.034

Notes: Watershed clustered robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; All specifications control for watershed fixed effects and project specific characteristics (age, make and type).

Maps and Figures

Map 1
Location of study districts

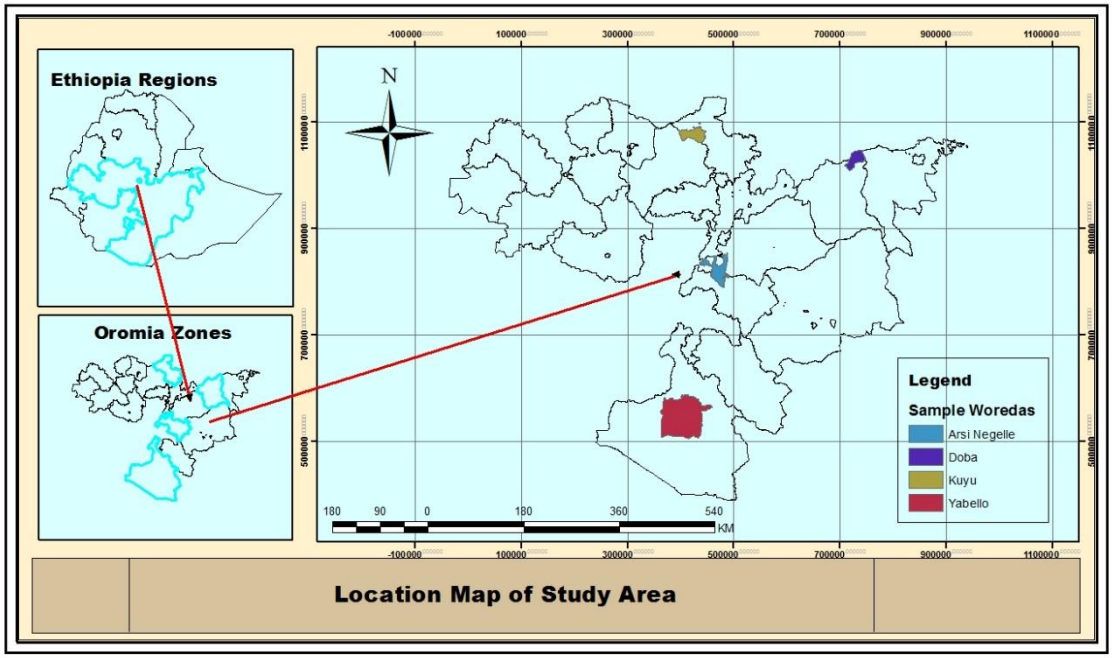
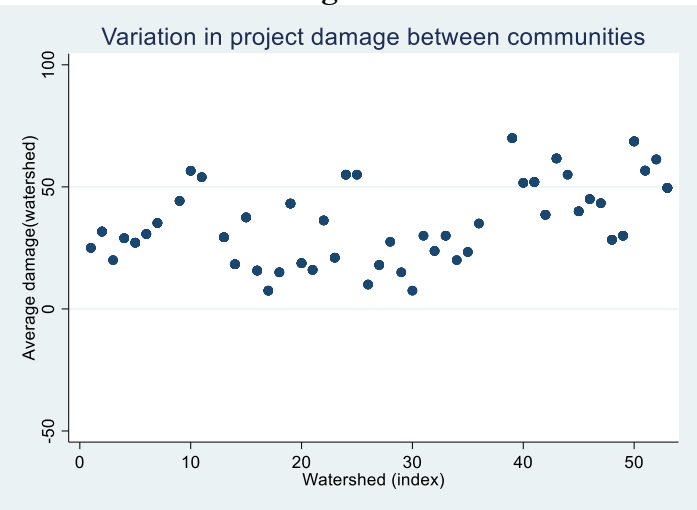
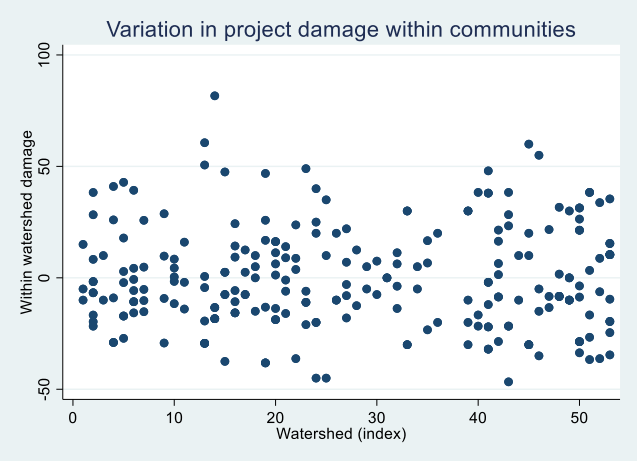


Figure 1



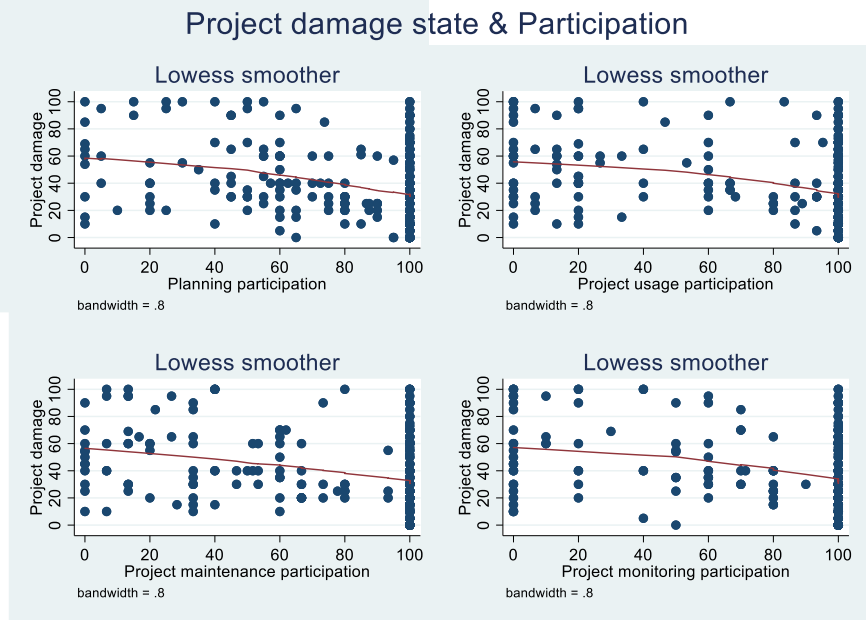
Note: The figure plots average project damage score (in percent) across the 49 watershed communities based on engineers' measurement with difference across points representing difference in project damage between watershed communities.

Figure 2



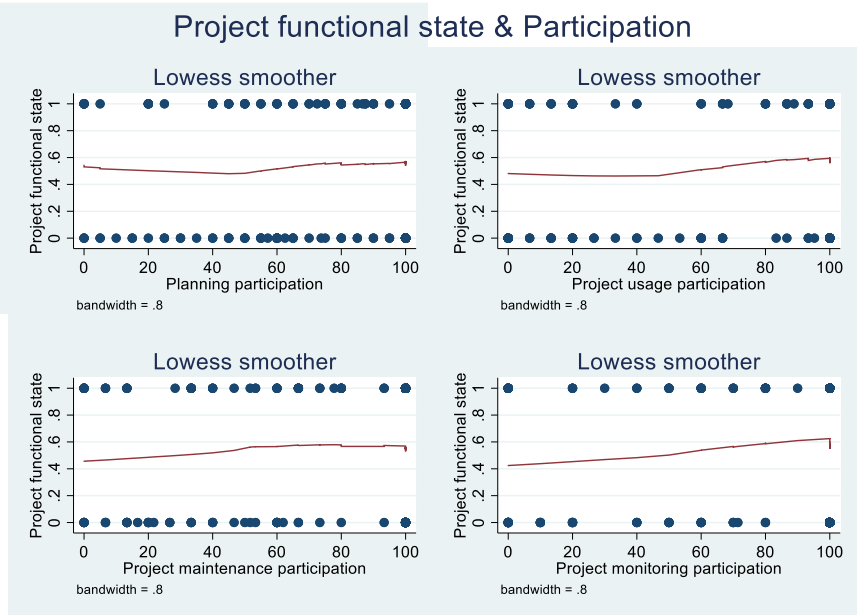
Note: The figure displays variation in project damage score within the 49 watershed communities i.e. each point is obtained by subtracting community mean damage from each project damage score.

Figure 3



Note: The figure displays the distribution and locally weighted bivariate regression of the outcome on project damage with the four measures of participation.

Figure 4



Note: The figure plots the distribution and locally weighted bivariate regression of project's functional state and the four main measures of participation.

Appendices

Table A1
Distribution of soil and water conservation structures surveyed per district (Planned vs actual)

District	Number of Soil and water conservation structures				Actual/planned (%)
	Planned		Actual		
	Number of villages	Total per district	Number of villages	Total per district	
Yabello	5	75	4	54	72
Kuyu	4	60	4	45	75
Arsi Negelle	2	40	3	46	115
Doba	6	120	6	104	87
Total	17	295	17	249	84

Table A2
Pairwise correlation between different decision categories

Variables	Project planning	Project use rule & benefit distribution	Project maintenance	Project monitoring & evaluation
Project planning	1.00			
Project use rule & benefit distribution	0.830***	1.00		
Project maintenance	0.812***	0.941***	1.00	
Project monitoring & evaluation	0.734***	0.785***	0.780***	1.00

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

Table A3
Project physical condition/damage: Structure Response Group versus Engineer's Evaluation

	Engineer			**Total**
SRG	Highly damaged (>50 percent damage)	Slight damage (25-50 percent damage)	Very little damage/undamaged (0-25 percent damage)	
Highly damaged (>50 percent damage)	**15**	8	3	26
Slightly damaged (25-50 percent damage)	26	**21**	3	50
Very little damage /undamaged	36	66	**70**	**172**
Total	77	95	76	248

Table A4
Project functional status: Structure Response Group versus Engineer's Evaluation

	Engineer		Total
SRG	Functioning	Not functioning	
Functioning	**131**	92	223
Not functioning	5	**21**	26
Total	136	113	249

Table A5
Project's operational state and damage state – SRG provided

	SRG			Total
SRG	Highly damaged (>50 percent damage)	Slight damage (25-50 percent damage)	Very little damage/undamaged (0-25 percent damage)	
Functioning	21	37	165	223
Not functioning	5	13	8	26
Total	26	50	173	249

Table A6
Project physical condition/damage: Project Response Group versus Engineer's Evaluation: Yabello district

	Engineer			**Total**
SRG	Highly damaged (>50 percent damage)	Slight damage (25-50 percent damage)	Very little damage/undamaged (0-25 percent damage)	
Highly damaged (>50 percent damage)	-	1	-	1
Slightly damaged (25-50 percent damage)	6	**4**	-	10
Very little damage /undamaged	12	17	**13**	**42**
Total	18	22	13	53

Table A7
Project functional status: Structure Response Group versus Engineer's Evaluation: Yabello district

	Engineer		Total
SRG	Functioning	Not functioning	
Functioning	**30**	19	49
Not functioning	3	**2**	5
Total	33	21	54

Table A8
Project physical condition/damage: Project Response Group versus Engineer's Evaluation: Kuyu district

	Engineer			**Total**
SRG	Highly damaged (>50 percent damage)	Slight damage (25-50 percent damage)	Very little damage/undamaged (0-25 percent damage)	
Highly damaged (>50 percent damage)	**4**	1	-	5
Slightly damaged (25-50 percent damage)	11	**4**	-	15
Very little damage /undamaged	6	16	**3**	**25**
Total	21	21	3	45

Table A9
Project functional status: Structure Response Group versus Engineer's Evaluation: Kuyu district

	Engineer		Total
SRG	Functioning	Not functioning	
Functioning	**21**	12	33
Not functioning	1	**11**	12
Total	22	23	45

Table A10
Project physical condition/damage: Project Response Group versus Engineer's Evaluation: Arsi Negelle district

	Engineer			**Total**
SRG	Highly damaged (>50 percent damage)	Slight damage (25-50 percent damage)	Very little damage/undamaged (0-25 percent damage)	
Highly damaged (>50 percent damage)	**3**	-	-	3
Slightly damaged (25-50 percent damage)	6	**2**	-	8
Very little damage /undamaged	12	14	**9**	**35**
Total	21	16	9	46

Table A11
Project functional status: Structure Response Group versus Engineer's Evaluation: Arsi Negelle district

SRG	Engineer		Total
	Functioning	Not functioning	
Functioning	**24**	16	40
Not functioning	1	**5**	6
Total	25	21	46

Table A12
Project physical condition/damage: Project Response Group versus Engineer's Evaluation: Doba district

SRG	Engineer			Total
	Highly damaged (>50 percent damage)	Slight damage (25-50 percent damage)	Very little damage/undamaged (0-25 percent damage)	
Highly damaged (>50 percent damage)	**8**	6	3	17
Slightly damaged (25-50 percent damage)	3	**11**	3	17
Very little damage /undamaged	6	19	**45**	70
Total	17	36	51	104

Table A13
Project functional status: Structure Response Group versus Engineer's Evaluation: Doba district

SRG	Engineer		Total
	Functioning	Not functioning	
Functioning	**56**	45	101
Not functioning	-	**3**	3
Total	56	113	104

Table A14
Determinants of community participation in planning decisions: Marginal effects after ordered probit

	No participation	One decision	Two decisions	Three Decisions	Four decisions
Respondent's characteristics					
Female	0.005	0.003	0.003	0.003	-0.014
	(0.013)	(0.006)	(0.008)	(0.008)	(0.034)
Age	0.0005	0.0002	0.0003	0.0003	-0.001
	(0.0004)	(0.0002)	(0.0003)	(0.0002)	(0.001)
Religion: Non-Muslim	0.012	0.006	0.007	0.007	-0.032
	(0.016)	(0.008)	(0.010)	(0.010)	(0.044)
Primary education	-0.023**	-0.012**	-0.015**	-0.015**	0.065**
	(0.011)	(0.006)	(0.007)	(0.008)	(0.030)
Secondary and above education	-0.036**	-0.021*	-0.029*	-0.032	0.119*
	(0.017)	(0.011)	(0.017)	(0.021)	(0.065)
Household size	-0.002	-0.0009	-0.001	-0.001	0.005
	(0.003)	(0.001)	(0.002)	(0.002)	(0.007)
Female headed household	0.008	0.004	0.005	0.005	-0.022
	(0.014)	(0.007)	(0.008)	(0.008)	(0.037)
Duration of membership	0.007***	0.003***	0.004***	0.004***	-0.018***
	(0.002)	(0.001)	(0.001)	(0.001)	(0.006)
Perception of PSNP & CBPWD					
PSNP addresses food insecurity	-0.020	-0.009	-0.012	-0.011	0.052
	(0.018)	(0.008)	(0.009)	(0.008)	(0.042)
PSNP well targeted	-0.002	-0.001	-0.001	-0.001	0.006
	(0.012)	(0.006)	(0.007)	(0.007)	(0.032)
Aware of CBPWD	-0.059***	-0.031***	-0.043***	-0.046***	0.179***
	(0.009)	(0.005)	(0.006)	(0.008)	(0.021)
Social Interactions					
Trust PSNP members	-0.012	-0.006	-0.008	-0.008	0.035
	(0.010)	(0.005)	(0.007)	(0.007)	(0.028)
Conflict between watershed streams	0.006	0.003	0.004	0.004	-0.016
	(0.058)	(0.027)	(0.034)	(0.032)	(0.151)
Conflict within watershed stream	0.064*	0.026**	0.030***	0.026***	-0.145**
	(0.033)	(0.011)	(0.011)	(0.009)	(0.062)
District					
Kuyu	0.294***	0.078***	0.076***	0.052***	-0.499***
	(0.043)	(0.012)	(0.010)	(0.008)	(0.047)
Arsi Negelle	0.170***	0.057***	0.062***	0.049***	-0.338***
	(0.045)	(0.013)	(0.012)	(0.008)	(0.068)
Doba	-0.086***	-0.041***	-0.053***	-0.053***	0.234***
	(0.018)	(0.009)	(0.011)	(0.011)	(0.042)
N	1,202	1,202	1,202	1,202	1,202
Pseudo R-sq	0.199	0.199	0.199	0.199	0.199

Notes: The specification controls for individual and household characteristics and perceptions on the PSNP and social interactions. Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.