The impact of Ethiopia's Productive Safety Nets and Household Asset Building Programme: 2006-2010

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Acronyms

CFI	chronically food-insecure
CPI	consumer price index
CSA	Central Statistical Agency (Ethiopia)
DA(s)	Development Agent(s)
DID	difference-in-difference
DS	Direct support
EAs	Enumeration areas
EFSS	Ethiopian Food Security Survey
FGD	Focus Group Discussions
FSP	Food Security Program
GFDRE	Government of the Democratic Republic of Ethiopia
GPS	Generalized Propensity Score
HABP	Household Asset Building Programme
HVFB	High Value Food Basket
KII	Key Informant Interview
MFIs	Microfinance Institutions
OFSP	Other Food Security Program
PA	Peasant Association
PSNP	Productive Safety Nets Programme
PW	Public Works
RDD	Regression Discontinuity Design
RUSACCO	Rural Savings and Credit Cooperatives
SNNPR	Southern Nations, Nationalities, and People's Region
TLU	Tropical Livestock Unit
USAID	United States Agency for International Development

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Executive Summary

1. This report assesses the impact of the Productive Safety Net, Other Food Security and Household Asset Building Programs on food security, assets, and agricultural production. It also examines whether these have led to investments in new nonfarm business activities and whether they have had disincentive effects. It addresses the following evaluation objectives found in the Food Security Program (FSP) Log Frame and the Terms of Reference for this study.

Evaluation objectives covered in this report

Measure the impact of the PSNP on the well-being of the chronically food insecure population		
	Food gap reduced	PSNP Log frame Super Goal PSNP Log frame Outcome a1
	Caloric availability at the household level	PSNP Log frame Super Goal PSNP Log frame Outcome a1
	Reduced need for coping strategies	PSNP Log frame Outcome a2 PSNP Log frame Outcome a3
	Asset holdings increased	PSNP Log frame Outcome a2 PSNP Log frame Outcome a3 HABP Log frame Outcome 2
	What is the impact of the PSNP on informal social protection instruments	TOR, para 35
	Does the use of PSNP transfers benefit all household members equally?	PSNP Log frame Outcome a4 TOR, para 42
What are the complementary roles played by the PSNP and HABP in achieving positive outcomes for the food insecure		
	Increased diversity of income sources including off-farm sources of income	HABP Log frame Outcome 1 HABP Log frame Output 1.1
	Asset holdings increased	HABP Log frame Outcome 2

2. Chapter 2 describes the methods used in this study. It explains the rationale behind our use of double-difference impact estimates and how dose-response estimators are used to construct these.
3. Chapter 3 provides contextual information. It emphasizes that the external environment in which the PSNP operates has been challenging. Food prices increased sharply between 2006 and 2010 and drought shocks are common. Despite this, the food gap fell from 3.6 months to 2.3 months. Asset levels have increased and distress sales have declined.
4. Chapter 4 considers the impact of the duration of participation in the Public Works component of the PSNP on food security and asset outcomes. It also considers whether participation duration has unintended consequences such as reducing private transfers or providing a disincentive to start nonfarm businesses. It notes that households that received payments for one year, typically received only tiny amounts—the median total Public Works payment for such households over a five-year period is only 186 birr. Our impact estimates match these households to those receiving more years of transfers. Taking the difference

between the impact estimate of a *change* in an outcome (the "before" and "after") for a household receiving, say, five years of payments ("with") and the impact estimate of a change in an outcome for a household receiving one year of payments (the "without" because, to reiterate, these households essentially receive nothing) yields our double-difference estimate of program impact. Calling the difference between one and five years participation our estimate of the impact of the PSNP (with the caveat that only 38 percent of beneficiaries received five years of transfers), we find that:

- The PSNP has improved food security by 1.05 months. This impact is statistically significant.
- There is an improvement in food security in all regions and these are statistically significant. This improvement is 0.75 months in Tigray, 1.84 months in Amhara, 0.88 months in Oromiya, and 1.32 months in SNNPR. While households receiving five years of payments in Tigray saw their food security improve by 1.64 months, even households obtaining one year of payments saw a positive improvement in their food security and this reduces the magnitude of the double difference impact estimate for Tigray.
- There is a statistically significant increase of 0.15 children's meals consumed during the lean season between 2006 and 2010. This increase is largest in Oromiya, where it rises by 0.23 meals.
- There is no impact on changing adult meal frequency during the lean season.
- Five years participation raises livestock holdings by 0.38 TLU relative to receipt of payments in only one year.
- There are differences in the impact on livestock holdings across regions. There is no impact in Tigray. This is likely because in Tigray, beneficiaries are discouraged from accumulating livestock, as part of a general effort aimed at reversing environmental degradation.
- In Amhara, households receiving transfers for only one year saw their holdings fall by –1.32 TLU while those receiving payments for all five years experienced a small increase, 0.29 animals. This leads to a 1.62 TLU impact. In SNNPR, the PSNP increases livestock holdings by 0.55 TLU.
- In Oromiya, there is an increase in the value of productive assets of 112 birr; this impact is statistically significant at the one percent level.
- There is no evidence that the PSNP crowds out private transfers nor does it reduce the likelihood that participants start nonfarm businesses.

5. Chapter 5 examines the joint impacts of payments for Public Works and the Other Food Security (OFSP) and Household Asset Building Programs (HABP) for the period 2006–2010. An important feature of our evaluation design is the fact that low levels of payments made to households receiving only one year of Public Works and the (relatively) high payments made to those getting five years of payments allows us to compare households with and

without the PSNP and households with and without the OFSP and HABP. Using this approach, we find the following:

- Relative to having no program benefits, having the PSNP and OFSP/HABP increases foods security by 1.53 months;
- For households receiving the PSNP, the OFSP/HABP provides an increase in food security of 0.61 months; and
- For households receiving the OFSP/HABP, the PSNP increases food security by 1.38 months.
- The joint receipt of the PSNP and OFSP/HABP leads to the accumulation of 1.00 TLU more than households that received neither. Households receiving both PSNP and OFSP/HABP accumulated 133 birr more in tools than households that received neither.
- Conditional on receiving the PSNP for five years, households that also had OFSP or HABP assistance produced 147 kg more grain. There is no impact of the PSNP and/or the HABP on acreage. Households receiving the PSNP, also having access to the OFSP or HABP, obtained yields that were 297 kg/ha higher than those households that only received the PSNP.
- These impacts on output and yields are consistent with the effects of the OFSP/HABP on fertilizer use and investments in stone terracing. Both are yield enhancing. Conditional on receipt of the PSNP, access to the OFSP/HABP raises the likelihood of using fertilizer by 19.5 percentage points and the probability of investing in stone terracing by 13 percentage points.
- Having both PSNP payments and OFSP/HABP services raises the likelihood of investing in fencing by 22.6 percentage points relative to households who have neither. Conditional on access to the OFSP/HABP, the PSNP raises this likelihood by 16.4 percentage points, while conditional on access to the PSNP, access to the OFSP/HABP raises it by 7.9 percentage points. This is consistent with synergistic effects of both programs—the OFSP/HABP provides technical assistance while the PSNP provides the financial resources necessary for this investment.

6. Direct Support payments are an important component of the PSNP (Chapter 6). Previous impact evaluations have not been able to assess their impact. Here we do so, finding that

    - Direct Support improves food security as measured by the number of months that the household reports that it can meet its food needs. In the few cases where average Direct Support transfers have been large, this effect is substantial. Increasing average Direct Support payments from 500 to 2,500 birr leads to a two-month improvement in food security.
    - There is no evidence that Direct Support has disincentive effects. Higher levels of Direct Support have led to more rapid asset accumulation. There is no evidence that Direct Support reduces (“crowds out”) private transfers and there is some evidence that private transfers are crowded in.

7. Chapter 7 considers the impact of the level of Public Works transfers on food security in the HVFB *woredas* of the PSNP. We find that average payments received by households that received payments in one year are very similar to average payments received by those who have received payments for three years. Also, relatively few households receive payments for only one year. Consequently, we examine the dose-response model in terms of the amount of transfers received as opposed to the numbers of years transfers were received. We find that
    - The PSNP has improved food security among households receiving the HVFB by 0.88 months. This impact is statistically significant.
    - There is a statistically significant increase of about 1 food group over the two-year period between 2008 and 2010.
    - There is no impact on changing the number of meals served to children in lean seasons.
    - Among children, a slight decline in the ratio of meals served in the lean season to meals served in the non-lean season is observed. However, there is no impact on number of meals served to children in the lean season. This impact is solely driven by an increase in the number of meals served in the non-lean season.
    - At low levels of transfers (100-600 birr), there is no impact on accumulation of livestock. However, as transfer levels increase, we find a statistically significant impact of increase of about 0.38-0.51 TLU between 2008 and 2010.
    - There is no impact on change in productive equipment.
    - There is no evidence that the PSNP crowds out private transfers nor does it reduce the likelihood that participants start nonfarm businesses. In fact, results show that receipt of a Public Works transfer increases the probability that a household enters nonfarm business activity.

Chapter 1: Introduction

1.1 Introduction

The introduction to the document describing the Government of Ethiopia's Food Security Programme 2010-2014 (GFDRE 2009a) notes that persistent food insecurity remains a major problem in many parts of Ethiopia. To address this, the last ten years has seen a shift away from ad hoc responses, such as those that characterized the major drought in 2002, to a planned, systematic approach. This was embodied in the Government of Ethiopia's Food Security Programme launched in 2005. The Government of Ethiopia has noted that this program had a number of significant achievements, inter alia:

> More than seven million people have received PSNP transfers enabling them to meet consumption needs, reducing the risks they faced and providing them with alternative options to selling productive assets. In addition, between 692,002 households (around 3.5 million people) received credit financed by the Government's Federal Food Security Budget Line between 2005 and 2007 . . . . There is also significant evidence that the programme is having an impact. The PSNP is smoothing consumption and protecting assets and a growing number of PSNP clients are having growing access to household building efforts. Where the two programmes are combined, particularly in areas where programmes were well implemented (indicated by a high level of transfers), household asset holdings have increased and crop production appears to have improved.

Despite these achievements, considerable food insecurity remains across much of Ethiopia and graduation from the program—a major policy goal—has been limited. Consequently, in 2009, the Government of Ethiopia relaunched the Food Security Programme with enhanced efforts being made to improve a key component, the Productive Safety Nets Programme (PSNP) and a replacement of the Other Food Security Programme (OFSP) with an enhanced set of activities to strengthen the capacity of households to generate income and increase asset holdings. The replacement to the OFSP, called the Household Asset Building Programme (HABP), includes a demand driven extension and support component and improvements in access to financial services.

This report has its origins in the intention of the Government of Ethiopia (GFDRE 2009a, 77) to carry out a biannual household survey to assess outcomes and impacts of all components of the FSP in chronically food-insecure *woredas*. This biannual survey was first carried out in 2006 and again in 2008. In 2006, the sample consisted of approximately 3,700 households located in 66 food-insecure *woredas* served by the PSNP. In 2008, these households were resurveyed and an additional 1,300 households, located in *woredas* in Amhara, that received a High Value Food Basket (HVFB), were also included. A strength of the quantitative data used in this report is that it is longitudinal—that is, it tracks the same communities and households, allowing us to see how the program evolves and how household well-being changes over time.

An important fact is that, in 2010, this strength is complemented by the inclusion of a suite of qualitative data collection techniques conducted in ten *woredas* where the quantitative survey was fielded.

1.2 Objectives and Structure of the Report

This is the second of three reports that will be produced using data collected in 2010. The first report, Berhane et al. (2011), documented progress in the implementation of the PSNP and the HABP and assesses trends in perceptions of the effectiveness and transparency of the PSNP and HABP among different groups of clients. It also described how living standards were evolving in PSNP and non-PSNP beneficiary households. The third report (Sabates-Wheeler et al. 2011) documents livelihoods and the implementation of the PSNP and HABP in Afar, Somali, and pastoral localities in Oromiya.

The report addresses the following evaluation objectives found in the FSP Log Frame and the Terms of Reference for this study.

Table 1.1 Evaluation objectives covered in this report

Measure the impact of the PSNP on the well-being of the chronically food insecure population		
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What are the complementary roles played by the PSNP and HABP in achieving positive outcomes for the food insecure		
	Increased diversity of income sources including off-farm sources of income	HABP Log frame Outcome 1 HABP Log frame Output 1.1
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Below we summarize the topics covered in each chapter.

Chapter 2: Data sources and methods. This chapter describes the data sources and methods that underpin this report.

Chapter 3: Food security, assets, and coping strategies. This chapter provides the context within which our estimates of impact are calculated and trends in outcomes of interest.

In particular, we examine the price changes of main staple food crops, livestock, and labor over the period 2006–2010. We also use information from the survey to examine the extent of shocks experienced by households. Finally, we examine changes in asset levels, food security, and coping strategies.

Chapter 4: The impact of payments for public works: 2006–2010. The PSNP has been in operation since 2005 and it is of interest to see its cumulative effect since inception. In this chapter, we do so, focusing on the impact of transfers received for Public Works (PW) employment between 2006 and 2010. The chapter begins by describing the payments data available to us. Using the methods described in Chapter 2, we then assess the impact of these on changes in the food gap, the food gap squared, livestock holdings and the value of productive assets. We disaggregate these impacts by region.

Chapter 5: The impact of the Household Asset Building Program: 2008–2010. The Household Asset Building Program (HABP) is one of four components of the Government of Ethiopia's National Food Security program. An objective of the HABP is to ensure that households are able to diversify their income sources and increase productive assets. Development agents (DAs) have a key role to play in the implementation of the HABP. An important task among several tasks of the DA is to assist households in the preparation and implementation of business plans, ensuring that business plans are the outcome of household decisions, not the supply-driven approach of the past. In this chapter, we consider the joint impacts of payments for Public Works and the Other Food Security (OFSP) and Household Asset Building Programs (HABP) for the period 2006–2010. We begin by providing some background information on these programs. As we explain below, the low levels of payments made to households receiving only one year of Public Works and the (relatively) high payments made to those getting five years of payments allows us to compare households with and without the PSNP and households with and without the OFSP and HABP. Using this approach, we first assess their joint impact on household food security. We then consider their impacts on crop production and fertilizer use before examining investments in agriculture (stone terracing, fencing, water harvesting) and new nonfarm own business activities.

Chapter 6: The impact of Direct Support payments: 2006–2010. Direct Support payments to food-insecure households that are unable to provide labor for public works are important component of the PSNP. Previous impact evaluations of the PSNP have not been able to assess their impact. However, with three rounds of data together with the application of new impact assessment methods of estimating dose-response makes it possible to do so here. This chapter begins by describing the Direct Support payments data available to us. Using the methods described in Chapter 2, we first assess the impact of Direct Support on measures of food security. We then consider their impact on livestock holdings, the value of productive assets, private transfers, and the likelihood of starting nonfarm own businesses.

Chapter 7: The impact of payments for public works in High Value Food Basket Woredas: 2008–2010. In a number of *woredas*, beneficiaries receive a High Value Food Basket consisting of cereals, oils, and pulses. In this chapter, we assess their impact on food security,

assets, private transfers, and the likelihood of starting nonfarm own businesses. As relatively few households receive only one year of transfers over the three-year period that we observe these households, we estimate the dose-response model using variations in the transfer level as the “dose.”

Chapter 2: Data Sources and Methods

2.1 Introduction

This quantitative impact evaluation relies on a longitudinal community- and household-level dataset collected in 2006, 2008, and 2010. These data are briefly described in section 2.2; it draws heavily from Berhane et al. (2011), which contains additional details. In addition, this chapter provides an introduction to the methods we use to assess impact.

2.2 Data

2.2.1 Sample design

The analysis presented in this report is based on longitudinal quantitative survey data collected at the household and locality levels. These data were collected in the four major regions covered by the PSNP; from north to south these are Tigray, Amhara, Oromiya, and Southern Nations, Nationalities, and People's Region (SNNPR). The first survey, the 2006 Ethiopian Food Security Survey (EFSS 2006) was implemented in June-August 2006, with the bulk of the interviewing conducted in July. A second round was fielded between late May and early July, 2008, and the most recent (third) round in June and July, 2010. Consequently, seasonality considerations are unlikely to confound comparisons made across rounds.

The first Food Security Survey sample, fielded in 2006, was based on power calculations conducted to determine the minimum number of sample enumeration areas and households needed to be able to identify impacts of the Food Security Program.[1] We used the share of chronically food-insecure (CFI) households as the outcome for the power calculations because this is the primary targeting criterion for the program and because FSP documents identify reducing the number of CFI households as a major goal of the program. According to the PSNP Implementation Manual (2004, p. 4), a household is considered CFI if it had three or more months of unmet food needs per year in each of the past three years.

We clustered the sample at the *woreda* level, the administrative unit at which program participation is assigned. Based on discussions with CSA, we assumed the sample design would include two *kebeles* or enumeration areas (EAs) per *woreda* in Amhara, Oromiya, and SNNPR, and three EAs per *woreda* in Tigray. We also assumed 25 households would be sampled in each EA. Using 50 households per *woreda* as the desired cluster size, we calculated the number of clusters needed to obtain the desired level of statistical power. Treating "success" as the absence of chronic food insecurity, we assumed initially that 30 percent of the sample was not chronically food-insecure. We assumed that the a sample size should be large enough to identify an effect size equivalent to a 10-percentage point increase in non-CFI; that is, raising the proportion of households that were not food-insecure to 40 percent. Seeking statistical power of 80 percent and a significance level of 0.05, we found that 62 sample clusters would be required. To account for additional sampling of *kebele* subclusters within the EA and

[1] See Gilligan et al. (2007) for a complete description of the sample and 2006 survey.

unbalanced samples of beneficiaries and non-beneficiaries, it was decided to be conservative and include 68 *woredas* as sample clusters.

Woredas were randomly sampled proportional to size (PPS) from a list of 153 chronically food-insecure *woredas* (excluding the sample surveyed for USAID), stratified by region. Within each *woreda*, sample *kebeles* serving as EAs were randomly selected from a list of *kebeles* with active Productive Safety Net Programs (PSNP). Within each EA, 15 beneficiary and 10 non-beneficiary households were sampled from separate lists for each group, yielding a sample of 25 households per EA. This procedure yielded a sample of 146 EAs and, because a few sampled households were not interviewed, a sample of 3,688 households.

In some parts of Ethiopia, PSNP beneficiaries receive a High Value Food Basket (HVFB) through resources provided by USAID. In 2005, a survey was conducted to study the PSNP in areas where the HVFB had been made available. Most of the sample for this survey covered *woredas* in Amhara, where USAID had its highest concentration of PSNP-related activities, although *woredas* in other regions were also included in the sample. It was decided to add part of this sample to the data collection for the second round of the EFSS fielded in 2008. This would make it possible to compare beneficiaries in these "HVFB *woredas*" with beneficiaries elsewhere in Amhara that received standard PSNP payments. The Amhara HVFB sample includes four EAs in each of the 11 *woredas* being surveyed and each of these EAs included 28 households. A few EAs had one or two more households than the average of 28, yielding a total sample size of 1,237 households. Power calculations confirmed that this sample was sufficiently large to detect a 50-percent difference in the size of the food gap and a 35-percent difference in the value of livestock holdings. HVFB *woredas* were also included in the 2010 EFSS.

Data on interviews conducted in 2010 are reported in Table 2.1. There were 3,366 households interviewed who form the 2006-2008-2010 panel. Across all three rounds, 3,140 households appear in all rounds, yielding an attrition rate of 14.8 percent or, over five years, just under 3 percent. In the HVFB *woredas*, of 1,297 households sampled in 2005, 1,137 were interviewed in 2008 and 1,146 households were interviewed in 2010. The effective sample of households for analysis in the impact report will be those households for which we have baseline household characteristics. We have this information for 3,038 households across all three rounds.

Table 2.1 Sample numbers, by round

	2005	2006	2008	2010	All three rounds
Number of households in the 2006-2008-2010 panel	–	3,688	3,288	3,366	3,140
Attrition rate	–	–	10.8%	8.7%	14.8%
Number of households from HVFB *woredas*	1,297	–	1,137	1,146	–
Number of FSS households that we have full range of baseline characteristics for (overlap with later rounds)		3,475	3,190	3,193	3,038
Attrition rate			8.2%	8.11%	12.57%

Source: Household survey.

Figure 2.1 shows the locations of *woredas* in the EFSS.

Table 2.2 presents the attrition rate by region. There is some regional variation where households in Tigray and SNNPR are less likely to leave the sample across the three rounds compared to Amhara and Oromiya.

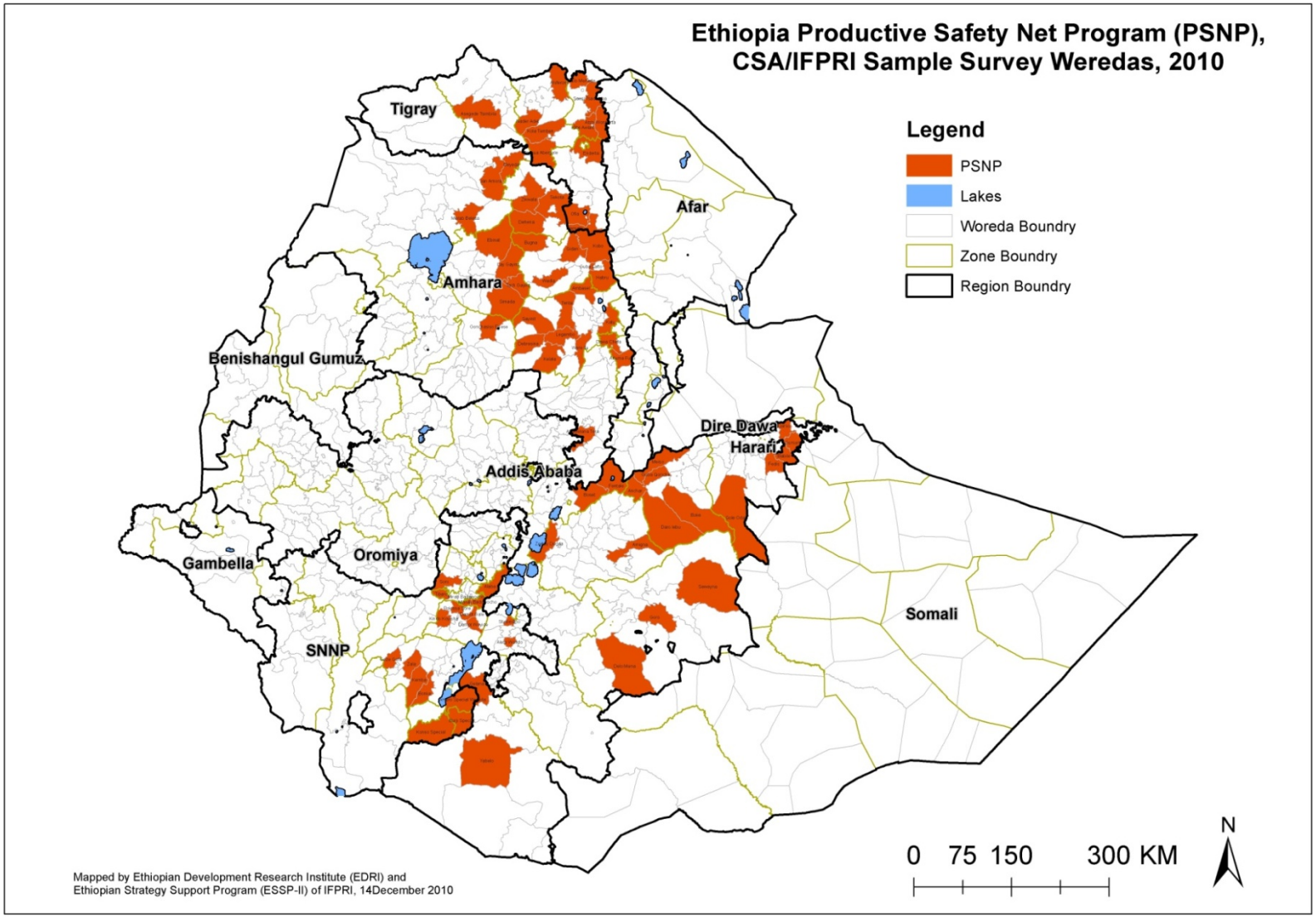
Table 2.2 Attrition, by region

	2006	2008	Attrition rate between 2006-08	2010	Attrition rate between 2006-10	Panel household (across all three rounds)	Attrition rate across all three rounds
Whole sample	3,475	3,190	8.2%	3,193	8.1%	3,038	12.6%
Tigray	843	807	4.3%	776	7.9%	770	8.7%
Amhara	806	703	12.8%	742	7.9%	665	17.5%
Oromiya	921	813	11.7%	828	10.1%	770	16.4%
SNNPR	905	867	4.2%	847	6.4%	833	8.0%

Source: Household survey.

Berhane et al. (2011) investigated whether potential differences in attrition rates can be attributed to differences in baseline characteristics by examining the correlation of the probability of attrition with household characteristics and region dummies. They show that being a beneficiary was not highly correlated with the probability of attrition. Older and smaller households were slightly more likely to attrite than other household types but the impact of these characteristics on attrition was small.

Figure 2.1 *Woredas* surveyed as part of the EFSS



2.2.2 Questionnaire design

An important feature of the EFSS is that the structure and content of the questionnaires has remained largely unchanged across survey rounds. This comparability means that interpreting changes in outcomes over time is not confounded by changes in the questions used to elicit these data. Table 2.3 describes the structure of the 2010 household questionnaire.

Table 2.3 Design of the 2010 household questionnaire

	Section	
Module	**Number**	**Heading**
1. Basic household characteristics	1A	Household demographics, current household members
	1B	Characteristics of the household
	1C	Former household members
	1D	Children's education and labor
2. Land and crop production	1	Land characteristics and tenure
	2	Input use and crop production
	3	Disposition of production
	4	Use of household labor in crop production
3. Assets	1	Production, durables
	2	Housing
	3	Livestock ownership
	4	Income from livestock
	5	Distress sales
4. Nonagricultural income and credit	1	Wage employment
	2	Own business activities
	3	Transfers
	4	Credit
5. Access to the PSNP and HABP	1	Access to the PSNP—public works
	2	Access to the PSNP—direct support
	3	Access to the HABP
	4	Perceptions of benefits of assets created by the PSNP
	5	Perceptions of operations of the PSNP
6. Consumption	1	Expenditure on durables and services
	2	Expenditure on consumables
	3	Food consumption
	4	Food availability, access and coping strategies
7. Health, shocks and perceptions	1	Long-term shocks
	2	Recent shocks to crops and livestock
	3	Poverty perceptions
8. Anthropometry	1	Height, weight of children 6m to 7y
	2	Access to water and sanitation, child feeding, women's perceptions

The household questionnaire was complemented by a questionnaire administered at the community (*kebele* or Peasant Association [PA]). Enumerators were instructed to Interview at least five people, perhaps together, who are knowledgeable about the community (e.g., community leaders, PA chairmen, elders, priests, teachers). They were to include at least one member of the *Kebele* Food Security Task Force and at least one woman and they are told that

they may need to meet with other members of the *Kebele* Food Security Task Force in order to complete some sections of this questionnaire. The community questionnaire covered the following topics: location and access; water and electricity; services; education and health facilities; production and marketing; migration; wages; prices of foodgrains in the last year; operational aspects of the PSNP including questions about the operations of the Food Security Task Forces, public works, and direct support. In addition, a price questionnaire obtained detailed information on current food prices.

2.3 Impact evaluation using the EFSS

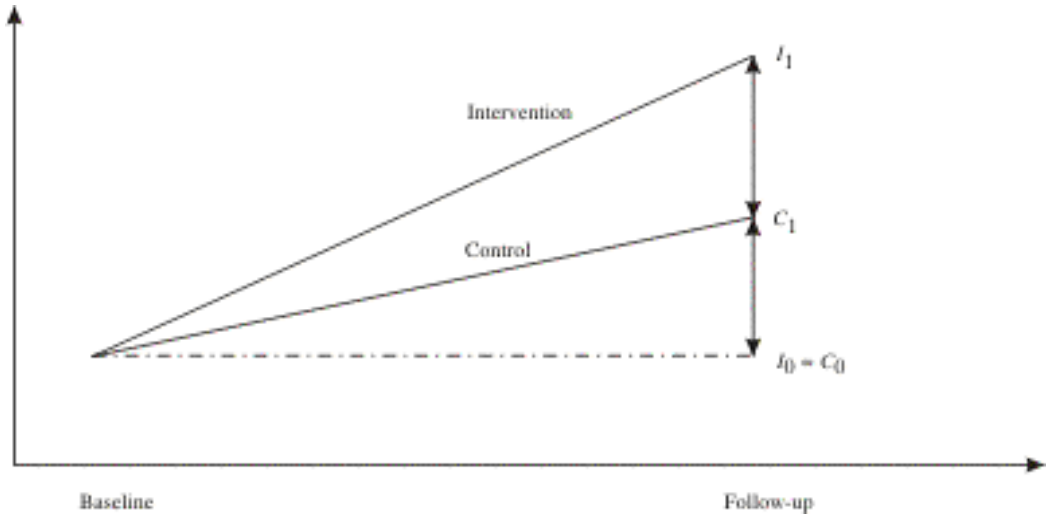
The simplest way of assessing the impact of the PSNP would be to compare mean outcomes for households that benefit from these programs to those who do not. So, for example, we could calculate the mean number of months of food security for PSNP beneficiaries and the mean number for non-PSNP beneficiaries. The problem, however, with this approach is that beneficiary households are likely to be systematically different from non-beneficiary households for many reasons in addition to their participation in the PSNP and these also affect food security. For example, as shown in Berhane et al. (2011), beneficiary households are poorer on average. As a result, the difference in months of food security—called the difference in unconditional means in the evaluation literature—is a biased estimate of impact; it reflects PSNP beneficiary status *and* these other characteristics. In order to eliminate this bias, sometimes referred to as selection bias, we must construct valid comparison groups.

Our evaluation strategy is specifically designed to address this bias. We do so by assessing impact in terms of *changes* over time between beneficiary and comparison households. This is sometimes referred to as a "before/after with/without" design or as the "difference-in-differences" or "double difference" method. To see why both "before/after" and "with/without" data are necessary, consider the following hypothetical situation. Suppose an evaluation only collected data from beneficiaries. Suppose that in between the first survey and the follow-up, some adverse event occurred (such as a drought) that makes these households worse off. In such circumstances, beneficiaries may be worse off—the benefits of the program being more than offset by the damage inflicted by the flooding. These effects would show up in the difference over time in the intervention group, in addition to the effects attributable to the program. More generally, restricting the evaluation to only "before/after" comparisons makes it impossible to separate program impacts from the influence of other events that affect beneficiary households.

The double-difference method can be illustrated graphically, as in Figure 2.2. For an arbitrary indicator measured over time, it is assumed that both the intervention and control groups start at the same level (on the vertical axis). No change in the indicator over time would lead to the outcome depicted by point $I_0 = C_0$. (Having the groups start at different points complicates the graphical exposition; the underlying logic, however, remains the same.) If only the intervention group were being followed, one would then naively calculate the effect of the program as $I_1—I_0$. However, as the control group makes clear, there was a trend over time that led to an improvement (in this example) of $C_1—C_0$. Estimates ignoring this would overstate the

effect of the program. Instead, the correct estimate of the program effect is $I_1—C_1$; this is the double-difference estimate since $I_0 = C_0$. In the case where the trend line for the control group was declining, ignoring that effect would tend to understate the program effect.

Figure 2.2 Illustration of the double-difference estimate of average program effect



Central to the implementation of double-difference is the construction of the treatment and comparison groups so that, at baseline, they are as comparable as possible. The preferred approach to constructing such a comparison group is to randomly provide access to the program among similarly eligible households. But because allocation of the PSNP was not randomized, this method was not feasible. The absence of "hard" targeting criteria (such as a means test) precludes the use of another popular evaluation technique, Regression Discontinuity Design (RDD). Consequently, we use matching methods to construct a comparison group by "matching" treatment households to comparison group households based on observable characteristics. The impact of the program is then estimated as the average difference in the outcomes for each treatment household from a weighted average of outcomes in each similar comparison group household from the matched sample. This approach was used successfully in earlier evaluations of the PSNP (see Gilligan, Hoddinott, and Taffesse [2007] and Gilligan et al. [2009b]).

Unfortunately, the methods used by Gilligan et al. suffer from three limitations that have become increasingly important over time. First, they rely on the construction of a comparison group who, although they have comparable characteristics, do not receive PSNP benefits. Berhane et al. (2011) show that over time, there has been considerable movement in and out of the PSNP, with the result that the number of households in the EFSS that have never received the PSNP has shrunk. Further, by definition, these households are observably different from current and past beneficiaries; over a six-year period they have never been deemed sufficiently food-insecure to warrant inclusion in the program. In preliminary work—not reported in this document—we experimented extensively with definitions of program

participation and with covariates used to match households defined as participants with nonparticipants. Repeatedly, we found that the number of control households was often less than 200 and, consequently, we found it difficult to produce robust, consistent impact estimates.

Second, it has not been possible to assess the impact of Direct Support transfers using matching methods. There are simply not enough households in the EFSS that have the characteristics of those receiving Direct Support and receive neither Direct Support transfers nor Public Works payments to construct a matched comparison group. Third, with the PSNP now in its sixth year, there are now some beneficiary households that, cumulatively, have received transfers for at least five years with the level of transfers that now run to the thousands of birr. It would be useful to know if there are diminishing, or increasing, impacts associated with longer program participation. This is not possible with the matching methods used in these earlier evaluations.

In light of these concerns, in this report we rely heavily on an extension of propensity score matching methods developed by Hirano and Imbens (2004) that allows us to assess the impact of the *duration* of program participation on outcomes of interest. They describe this in terms of estimating a "dose-response function" where the "dose" here is the number of years a household receives PSNP payments and the "response" is the impact that that level of transfers has on the outcome of interest. As Hirano and Imbens explain, we cannot simply assess impact through an examination of the relationship between observed transfer levels and outcomes because of the selection bias problem noted above. Because the level of transfers received by beneficiary households is not a random variable, failing to control for factors that affect both the level of transfers that are received and outcomes of interest lead to bias in this estimated relationship. Hirano and Imbens (2004) show how, under certain condition, an extension of the estimation of the propensity score eliminates the bias in this relationship.

In the appendix to this chapter, we describe the technical details associated with this method. Here we provide an example of how to interpret the results of estimating the dose-response relationship. Figure 2.3 shows the results of estimating the impact of in-kind transfers on the number of months that a household reports that it is food-secure. The horizontal axis denotes different numbers of years that the household receives Public Works payments and the vertical axis predicted changes in the months of food security between 2006 and 2010. Starting at the one-year level, these predicted changes are calculated for transfer levels given in yearly intervals between one and five years. That is, we calculate the predicted impact of receiving PSNP payments for only one year, for two years, for three years, and so on. The blue line in Figure 2.3 shows the "dose-response"; it traces out the size of the predicted change in food security given differing number of years of program participation. Note, as is the case here, that the relationship between transfer levels and outcomes is not pre-defined to be linear; rather the Hirano-Imbens method allows the data to trace out the form of the relationship.

Figure 2.3 The relationship between in-kind transfers and changes in the food gap, 2006-2010

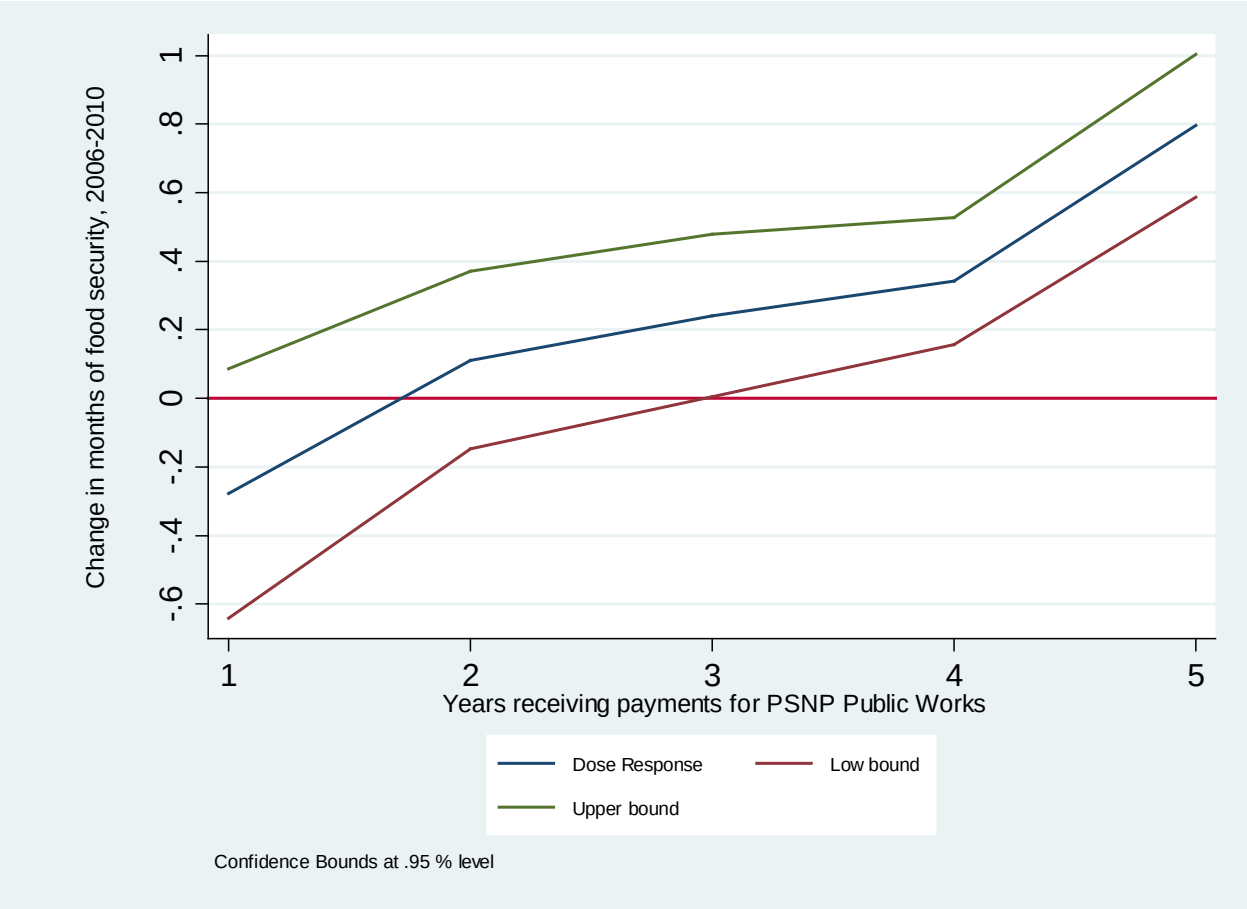


Figure 2.3 shows that given receipt of Public Works payments for four years, food security between 2006 and 2010 improves by just under 0.4 months. An attractive feature of this method is that we can calculate standard errors for these predicted impacts; these are the green and red curves in Figure 2.3 and show the upper and lower bounds of these predicted effects. Since we are looking at improvements in food security, the lower bound estimate is of particular interest. Where the lower bound estimate is greater than zero—as is the case when households receive Public Works payments for three, four, or five years, the predicted impact is statistically significant. These results can also be presented in tabular form, as in Table 2.4 that lists transfer levels, the predicted impact at that transfer level and the t statistic (obtained by dividing the predicted impact by its standard error).

Table 2.4 Dose-response estimates of impact on change in months of food security of years receiving Public Works payments

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.250	0.150	-1.667	*
2	0.130	0.118	1.102	
3	0.210	0.107	1.963	**
4	0.380	0.082	4.634	***
5	0.801	0.086	9.314	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

It is important to note that we can use results reported in tables like Table 2.4 to assess the change in impact between receipt of transfers for, say, one year and for five years. In Table 2.4, this difference is (0.801)—(–0.250), which equals 1.05 months. This says that households that received PW payments for five years experienced a larger improvement in food security, 1.05 months, than households that received PW payments for only one year. This is an example of the double-difference impact estimates described above. We are comparing the difference in the change in food security for one group (households getting payments for five years) with the change in food security for another group (households getting payments for only one year). Further, because we calculate the standard errors of these impact estimates, we are able to test the null hypothesis that the impacts—in this case, receiving five years rather than one year of transfers—are equal. Where they are unequal, we will reject this null hypothesis.

Appendix 2.1: Estimating Dose-Response Functions

Let Y_i^1 be the outcome of the *i*th household if it is a beneficiary of an intervention such as the PSNP and let Y_i^0 be that household's outcome if it does not receive the program. The impact of the program is given by $\Delta = Y_i^1 - Y_i^0$. However, we only observe the household, and therefore Y_i in one state, the household either gets or does not get the program. Let *D* indicate whether the household receives PSNP transfers (the "treatment"): *D* = 1 if the household receives the program; *D* = 0 otherwise. Accordingly, the evaluation problem is to estimate the average impact of the program on those that receive it:

$$\Delta^{ATT} = E\left(\Delta \mid X, D=1\right) = E\left(Y^1 - Y^0 \mid X, D=1\right) = E\left(Y^1 \mid X, D=1\right) - E\left(Y^0 \mid X, D=1\right), \quad (1)$$

where *X* is a vector of household characteristics that serve as control variables and subscripts have been dropped. This measure of program impact is generally referred to as the "average impact of the treatment on the treated." We observe values for the expression $E(Y^1 \mid X, D = 1)$ in our data. That is, for households who receive PSNP transfers, we do observe outcomes Y^1 given their characteristics, *X.* The problem we face is that $E(Y^0 \mid X, D = 1)$—conditional on *X,* the outcome values that a PSNP household (D = 1) would have received if it had not received program benefits, (Y^0), is not observed.

One way of addressing this problem would be to match households that were similar—that is, they have comparable *X*'s. While this might be feasible if there were only one or two relevant household characteristics, it is infeasible when the number of elements in *X* is large ("the "curse of dimensionality"). Rosenbaum and Rubin's (1983) contribution was to show that matching can be made on the basis of the probability (or propensity) to participate in a program, given the set of characteristics *X*. Let *P*(*X*) be the probability of participating in the PSNP. Using this notation, $P(X) = \Pr(D = 1 \mid X)$. Propensity score matching constructs a statistical comparison group by matching observations on beneficiary households to observations on non-beneficiaries with similar values of *P*(*X*). This requires that:

$$E\left(Y^0 \mid X, D=1\right) = E\left(Y^0 \mid X, D=0\right), \quad (2)$$

and

$$0 < P(X) < 1, \ \forall \ X. \quad (3)$$

The first assumption, known as conditional mean independence or unconfoundedness (Imbens and Wooldridge 2009) requires that after controlling for *X*, mean outcomes for nonparticipants are identical to outcomes of participants if they had not received the program. Expression (3) assures valid matches by assuming that *P*(*X*) is well-defined for all values of *X*. Rosenbaum and Rubin show that if outcomes are independent of program participation after conditioning on *X*, then outcomes are independent of program participation after conditioning

only on $P(X)$. If (2) and (3) hold, propensity score matching provides a valid method for estimating $E(Y^0 \mid X, D = 1)$ and obtaining unbiased estimates of (1).

Matching estimates of impact can be further improved by measuring outcomes for treatment and comparison groups before and after the program begins. This makes it possible to construct "difference-in-differences" (DID) estimates of program impact, defined as the average change in the outcome in the treatment group, ($D = 1$), minus the average change in the outcome in the comparison group, ($D = 0$). The main strength of DID estimates of treatment effects is that they remove the effect of any unobserved variables that represent persistent (time-invariant) differences between the treatment and comparison group. This helps to control for the fixed component of various contextual differences between treatment and comparison groups, including depth of markets, agroclimatic conditions, and any persistent differences in infrastructure development.

Hirano and Imbens (2004) have extended propensity score methods to cases where, as with the PSNP, treatment is continuous. Define $\mathcal{T}$ as the set of all treatment levels (such as transfers received under the PSNP) and T as a specific treatment(transfer) level. Define the treatment interval $[t_0, t_1]$, so that $T \in [t_0, t_1]$.[2] We are interested in calculating the average dose-response function, $\mu(t) = E[Y(t)]$. Hirano and Imbens note that the unconfoundedness assumption in the binary case can be generalized to the case where T is continuous. They define the Generalized Propensity Score, R, as $R = r(T, X)$. They note that "The GPS has a balancing property similar to that of the standard propensity score. Within strata with the same value of $r(T, X)$ the probability that $T = t$ does not depend on the value of X" (Hirano and Imbens 2004, 2). In combination with unconfoundedness, Hirano and Imbens prove that assignment to treatment is unconfounded, given the generalized propensity score.

To implement their approach, we first estimate the values of the GPS. We assume that the treatment variable is normally distributed, conditional on the covariates X:

$$g(T) \mid X \sim N\{h(\gamma, X), \sigma^2\}. \tag{4}$$

We estimate (4) using maximum likelihood and calculate the GPS as:

$$\check{R}_i = [2\pi\, \sigma^2]^{(-0.5)} \exp[\, (-(2\sigma^2)^{-1})[\, g(T_i) - h(\gamma, X)]]. \tag{5}$$

Next, as with case of a binary outcome, we test the balancing properties. As described in Kluve et al. (2007), to do so, we divide the sample into three equalizing sized groups based on the distribution of the treatment variable, cutting the sample at its tertiles. We then divide each group into five blocks by the quintiles of the GPS using only the GPS distribution of households in that group. Within each block, we calculate differences in means of each element of X for households in a given block compared to households in the same group but in different blocks. As Kluve et al. note, this procedure tests if, within each group, covariate means of households

[2] In the case of dichotomous treatment, $\mathcal{T} = D$ where $D \in [0, 1]$.

belonging to the particular treatment-level group are significantly different from those of household with a different treatment level, but similar GPS. A weighted average over the five blocks in each treatment-level group is then used to calculate a t-statistic of the differences-in-means between the particular treatment-level group and all other groups. This procedure is repeated for each treatment-level group and each covariate. If adjustment for the GPS properly balances the covariates, differences-in-means should not be statistically different from zero.

If the balancing property is satisfied, next we estimate the conditional expectation of *Y*, given *T* and *R*. Ex ante, we do not know the functional form this takes and so Bia and Mattei (2008) suggest using polynomial approximations of order one, two, and three. Having done so, we can obtain a dose-response function by estimating the average potential outcome at specified levels of treatment (transfers) and use bootstrap methods to calculate the confidence intervals for these.

Using maximum likelihood, we estimate equation (4). For example, to obtain the results shown in Figure 2.3, we assume that characteristics of the household head (age, sex, social connections), wealth of the household (landholdings, number of oxen), shocks (drought, illness), and household location (proportion of households experiencing drought shocks, changes in staple grain and cattle prices) are correlated with the years of program participation and the outcomes we consider.

Our next step is to test the balancing properties of these data. We divide the sample into three tertiles based on treatment levels. Following Carneiro and Rodrigues (2009), we first test whether the mean for each covariate in each group differs from the mean value of this covariate in the other two groups combined. We then calculate these mean differences adjusting for the GPS as described above. With 33 covariates, we calculate 99 t-statistics and assess whether, at the 90 and 95 confidence levels, we do not reject the null hypothesis that the mean difference in covariates is zero. Before the adjustment, there are many mean differences in covariates where we reject this null hypothesis at either confidence level. After adjusting for the GPS, the number of t-statistics higher than 1.645 or 1.96 is four and one, respectively, implying that the GPS successfully balances the covariates.

Next we estimate the conditional expectation of *Y*, given *T* and *R,* where here Y is the change in months of food security between 2006 and 2010. Initially, we use a linear specification that only includes the treatment (years of participation) level, the GPS, and the interaction (years *x* GPS) of these two terms. We use the results of this estimation to calculate a dose-response function at specified levels of transfers and use bootstrap methods to calculate the confidence intervals for these. This produces the results shown in Figure 2.3. As a specification check, we use a quadratic specification finding that this gives similar estimates.

Chapter 3: Food Security, Assets, and Coping Strategies

3.1 Introduction[3]

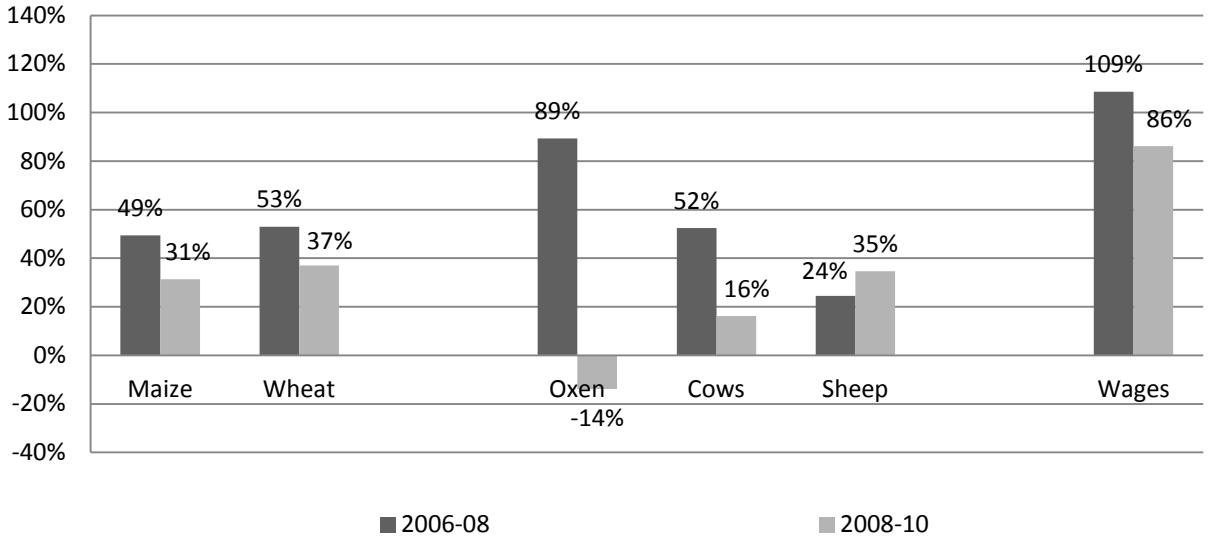
This chapter provides the context within which our estimates of impact are calculated and trends in outcomes of interest. In particular, we examine the price changes of main staple food crops, livestock, and labor over the period 2006–2010. We also use information from the survey to examine the extent of shocks experienced by households. Finally, we examine changes in asset levels, food security, and coping strategies.

3.2 Context

Like the rest of the world, Ethiopia also experienced a dramatic rise in food prices in 2007–08. This had implications for purchasing power of wages as well as food security among households that are net buyers of food. Figures 3.1a–3.1d show the change in main staple food crops prices, livestock prices, and wages between 2006–08 and 2008–10 by region.

As one would expect, there were significant increases in food prices in 2006–08 with further increases, although smaller in magnitude between 2008 and 2010. Livestock prices also rose significantly during 2006–08 in all four regions. The labor market response to the sharp increase in food prices in 2006–08 is quite strong in Tigray and Amhara—where nominal wages nearly double over this period.

Figure 3.1a Price changes, Tigray, 2006–08 and 2008–10



[3] This is an abbreviated version of Chapter 3 of Berhane et al. (2011).

Figure 3.1b Price changes, Amhara, 2006–08 and 2008–10

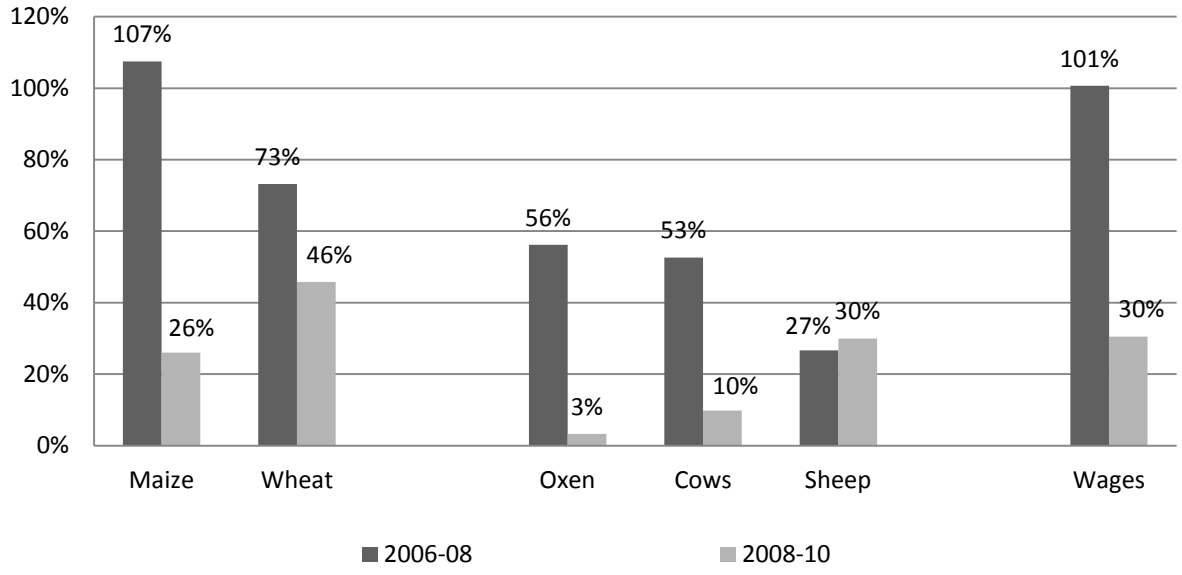


Figure 3.1c Price changes, Oromiya, 2006–08 and 2008–10

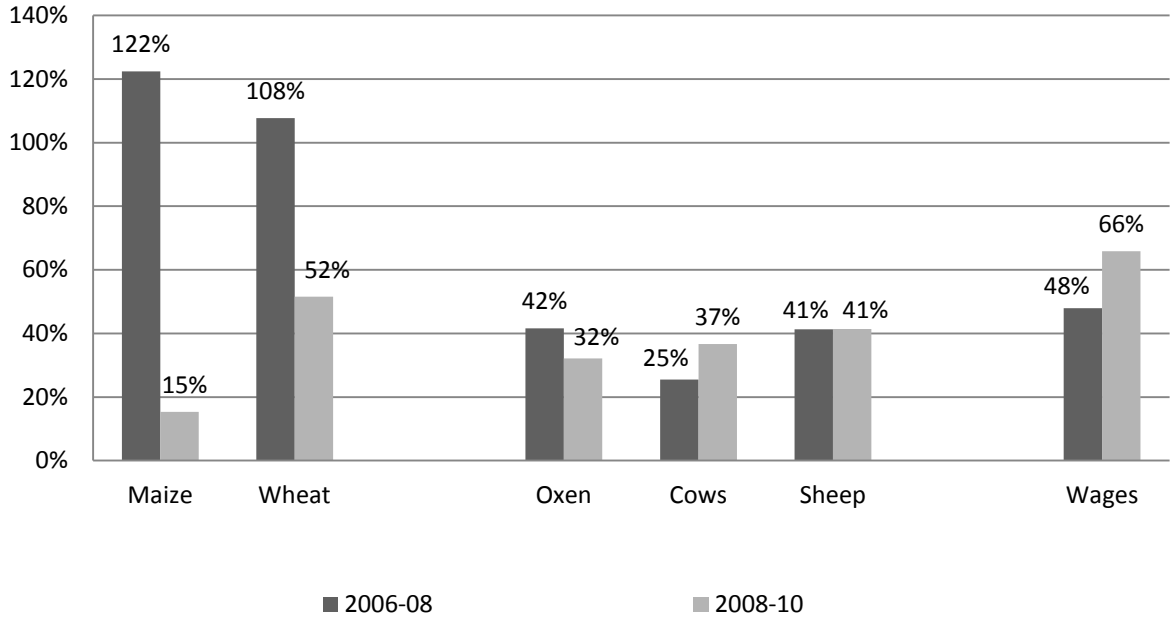
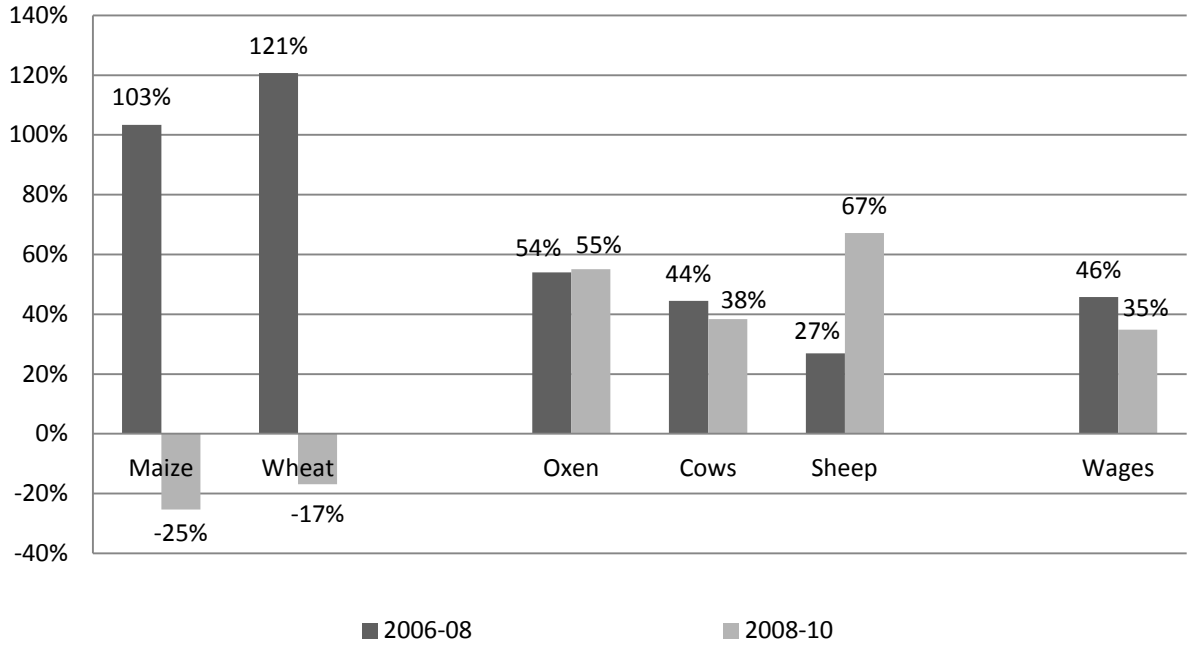


Figure 3.1d Price changes, SNNPR, 2006–08 and 2008–10



3.3 Incidence of Shocks

One of the goals of the FSP is to protect households from shocks; in Figure 3.2 we assess the prevalence of shocks across the three survey rounds. In general, incidence levels of various shocks in 2010 are almost as high, if not higher, as previous years. In particular, we observe that a much larger fraction of households experience weather-related shocks, such as drought, flood, and erosion. We also observe a 9-percent increase in the fraction of households that did not have access to input markets. There is also a sharp increase in the fraction of households that experienced illness (up from 7 percent in 2008 to 17 percent in 2010).

Figures 3.3a–3.3d present the incidence of these shocks by regions and shows that there is considerable regional variation in the incidence of shocks. In particular, even though drought remains the most important shock in the Amhara region, its extent is less than the other three regions. A much larger fraction of households in Tigray and Oromiya experienced a drought shock in 2010 compared to 2008, whereas this fraction declined slightly in Amhara and SNNPR. Households in SNNPR are more likely to experience flood compared to other regions and the fraction of households affected more than doubled since 2008, as did the fraction of households that experienced losses due to erosion. Lack of access to input markets and increases in input prices are more prevalent in SNNPR.

Figure 3.2 Incidence of shocks

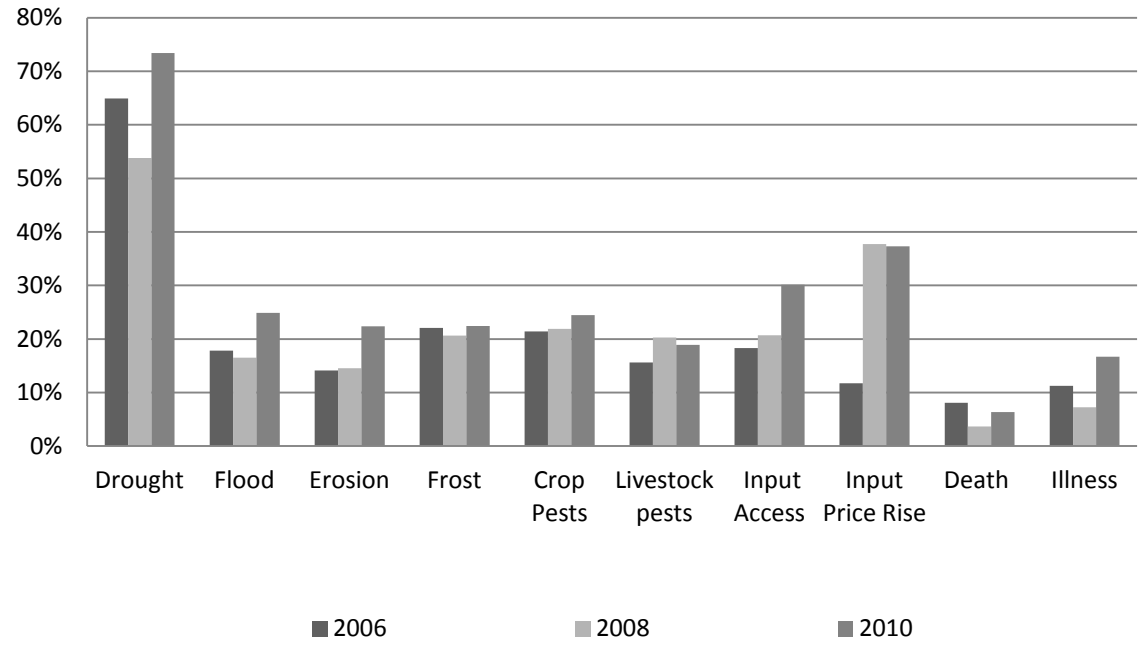


Figure 3.3a Incidence of shocks, Tigray

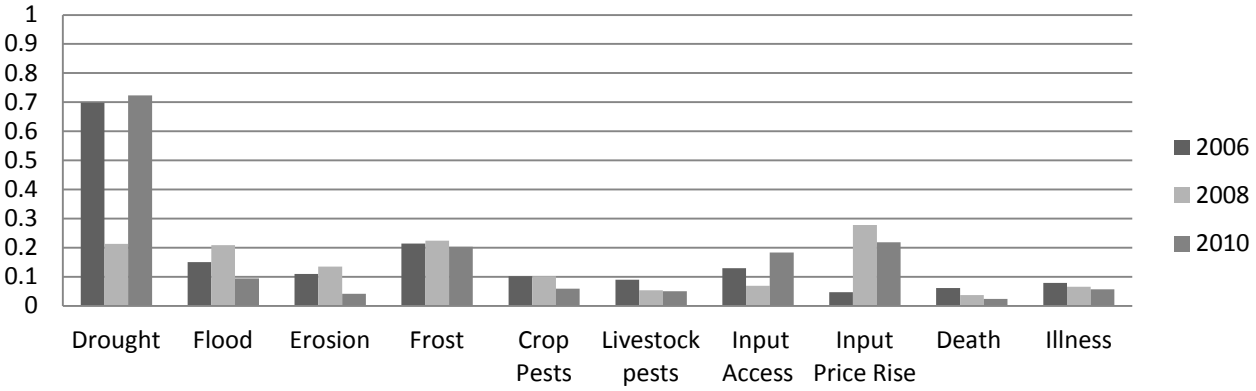


Figure 3.3b Incidence of shocks, Amhara

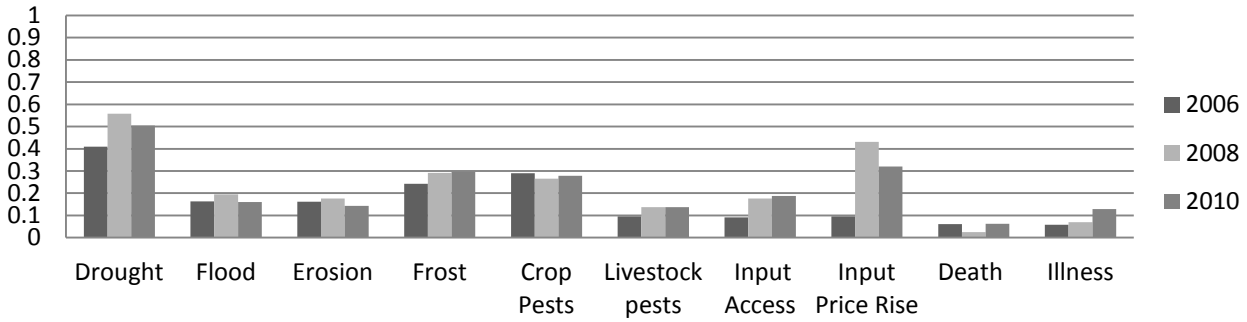


Figure 3.3c Incidence of shocks, Oromiya

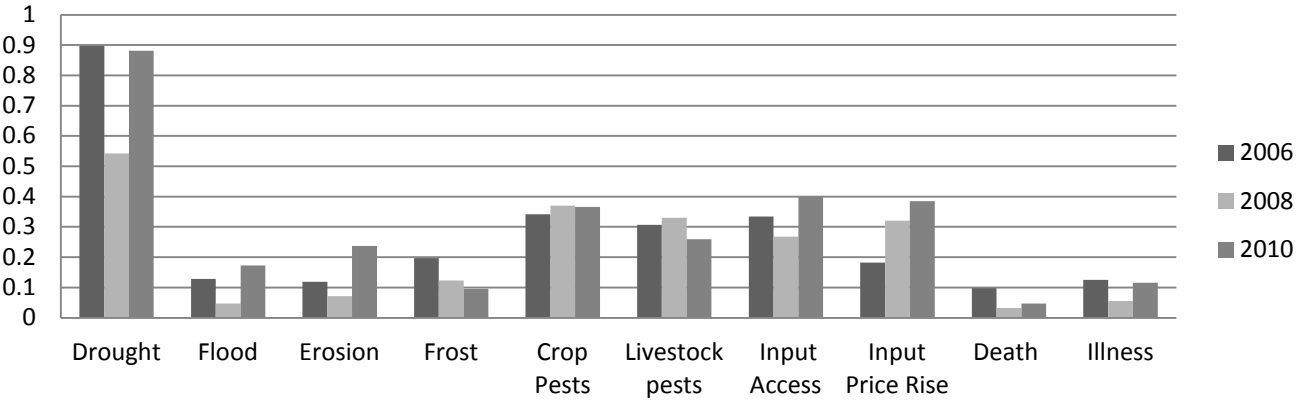
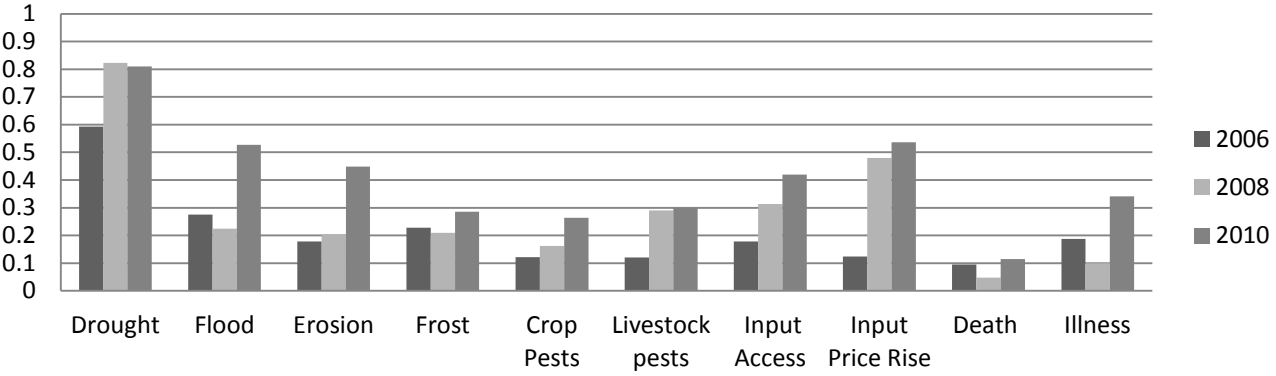


Figure 3.3d Incidence of shocks, SNNPR

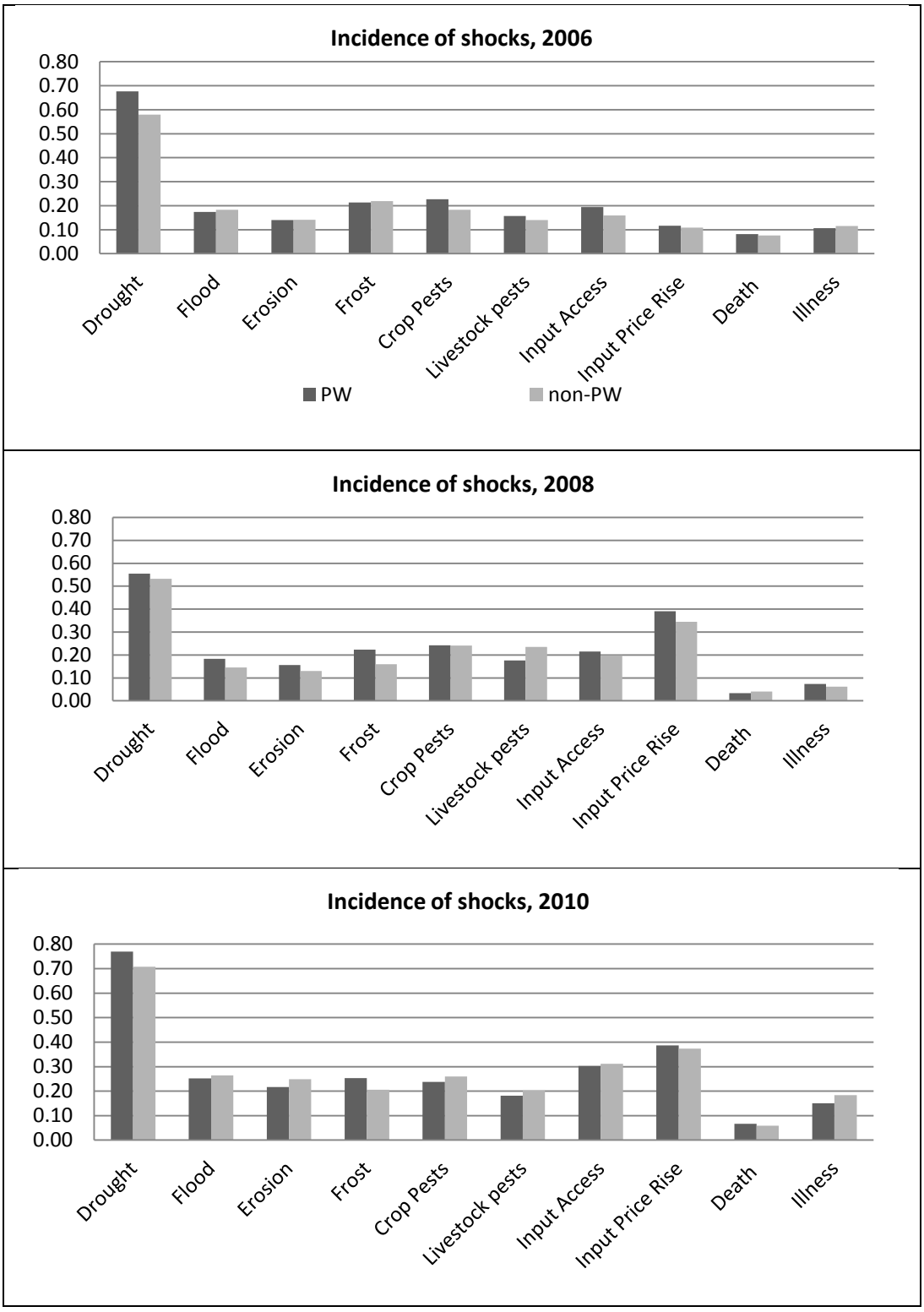


In terms of idiosyncratic shocks like death and illness, all regions except Tigray, show an increase in the fraction of households that reported experiencing these shocks in 2010 compared to 2008. This increase is the largest in SNNPR, where the fraction of households that experienced an illness in the household went up from 10 percent to more than 30 percent.

Next we examine whether experiencing various shocks differs by beneficiary status under the FSP. We compare households that receive payments under the public works (PW) component of the FSP in each year with households that were not part of the FSP at all. Figure

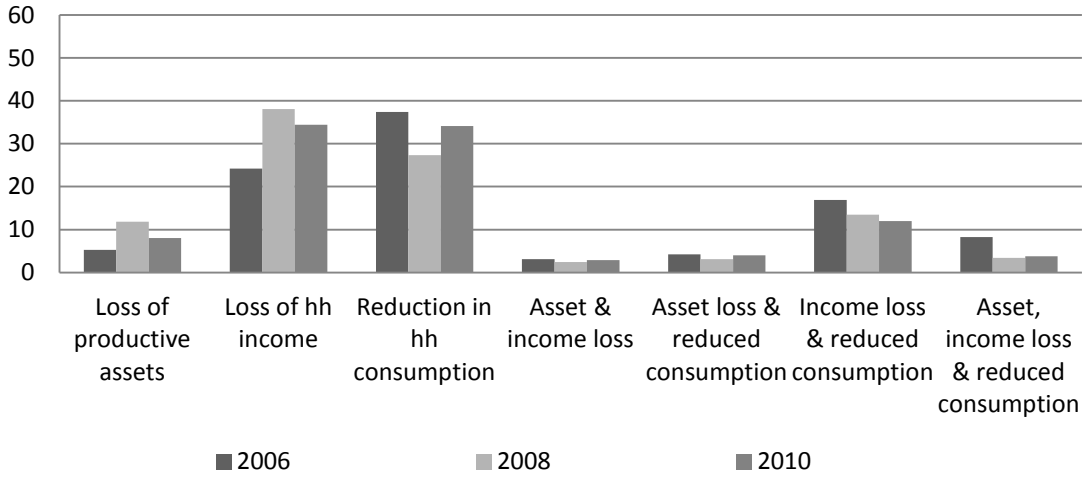
3.4 gives this information. A quick look at these graphs shows that in each year, the average experience of PW beneficiaries and non-beneficiaries is similar.

Figure 3.4 Incidence of shocks, by PW beneficiary status and year



Households were asked about consequences of shocks experienced. Figure 3.5 gives the response of households for having experienced a drought. A large fraction of households have to incur a loss in income or consumption as a result of a drought shock. This shows that a drought not only has negative implications for household income, it also adversely affects household consumption. About 10 percent of households affected by a drought lost productive assets. The pattern of responses remained constant between 2006 and 2010.

Figure 3.5 Consequences of experiencing a drought, all households

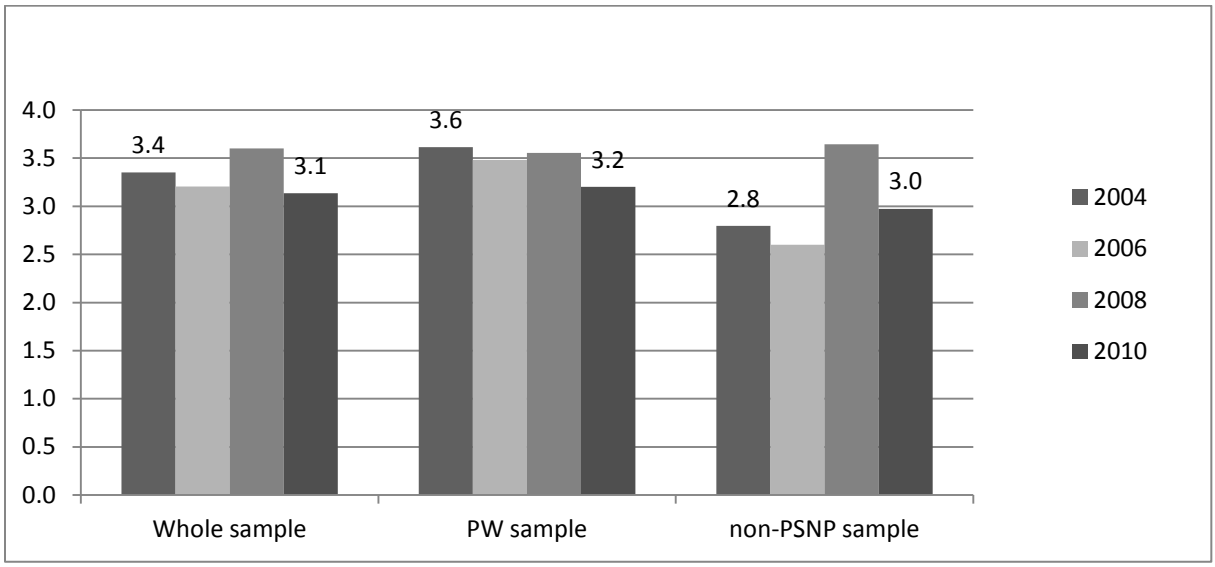


3.4 Food Security

It is now common knowledge that households face severe food shortages around the rainy and planting season in Ethiopia. Respondents were asked about the number of months they had difficulty fulfilling their household food requirements in the last year.[4] Figure 3.6 presents the average number of months in a year households were unable to satisfy their food needs from 2004-2010 by beneficiary status. It shows that the food gap was 3.4 months for the entire sample in 2004 and declined to 3.1 months by 2010. The public works beneficiaries started out with a slightly higher food gap of 3.6 months as compared to 2.8 months among the non-beneficiaries in 2004. By 2010, the food gap among the PW beneficiaries had gone down to about 3.2 months whereas it rose to 3 months among the non-beneficiaries.

[4] A household is considered as food insecure in a given month if the household was unable to satisfy its food needs for at least five days in the month.

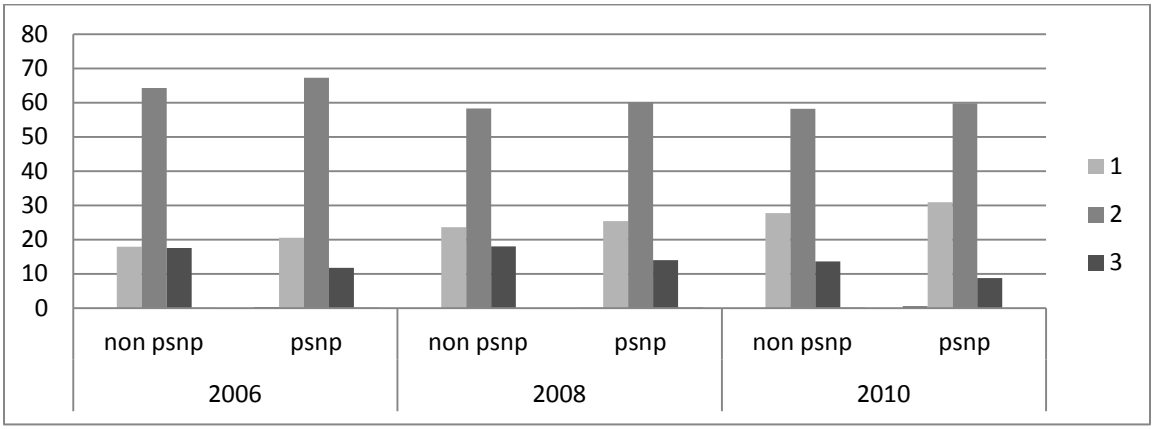
Figure 3.6 Average food gap, by beneficiary status



Number of Meals

Households often adopt negative coping strategies when falling short of meeting their daily food requirements from own or external sources. Assessing the ability of the household to consume the ideal number of meals per day household members eat in a normal day would thus provide a self-assessed picture of household food security. For this purpose, households were asked to report the number of meals adult and child members of their household eat per day on a normal and worst food-insecure day. The results are summarized in the following graphs. Figures 3.7a–3.7c provide the number of meals per day adult and children members eat during a normal and worst food gap month.

Figure 3.7a Number of meals per day adults eat during the lean season



The number of meals adults and children eat in a normal month is given in Figure 3.7b-3.7c for comparison purposes. First we note that the majority (about 75 percent) of households in all the three years reported adults eat three times a day during months with no food shortages. Similarly, with the exception of 2010, where about 40 percent of households report that children eat about 5 times a day, the majority (about 38–45 percent) of households reported children eat 3-4 meals a day in months with no food shortages.

Figure 3.7b Number of meals per day adults eat, non-lean season

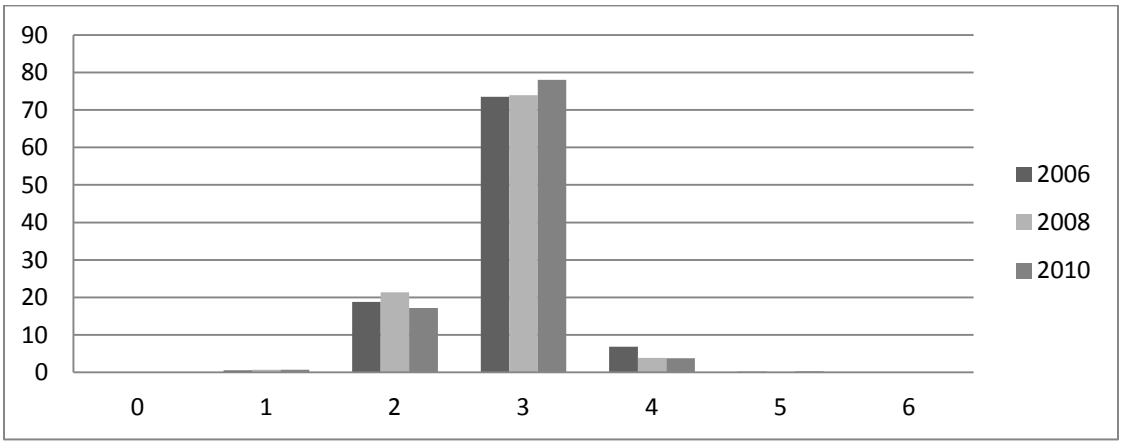
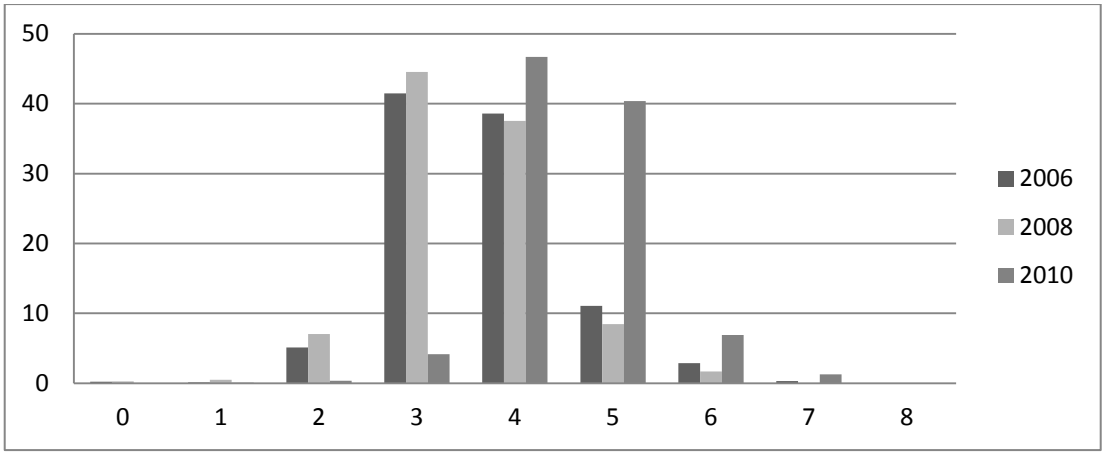


Figure 3.7c Number of meals per day children eat, non-lean season



Figures 3.8a and 3.8b show the average number of meals household adults and children eat in normal and food shortage months by region. This is given by region to assess if averages vary across regions. The average number of meals per day in a food shortage month is 2 for adults and 3 for children. In a good month, the average number of meals for adults is 3 and for children it ranges between 3 and 4. All regions show improvement between 2006 and 2010 for both adults' and children's number of meals except for Tigray and Amhara, which saw a slight decline in meals consumed by adults and children in months with food shortages.

Figure 3.8a Average number of meals per day—Adults

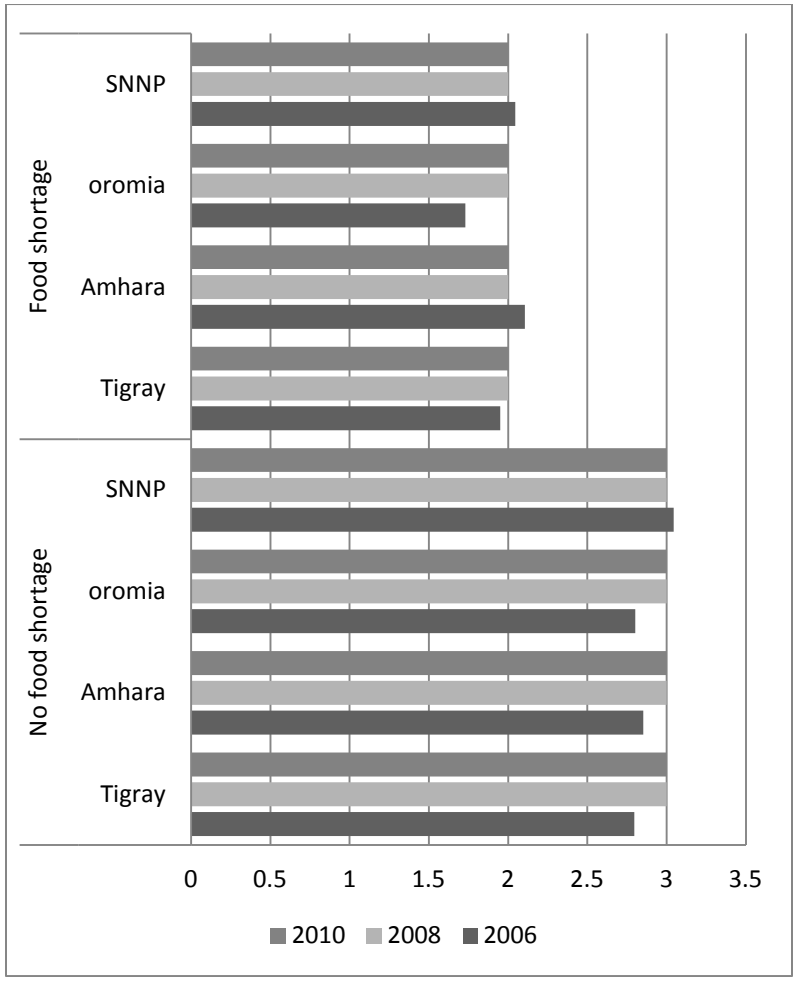
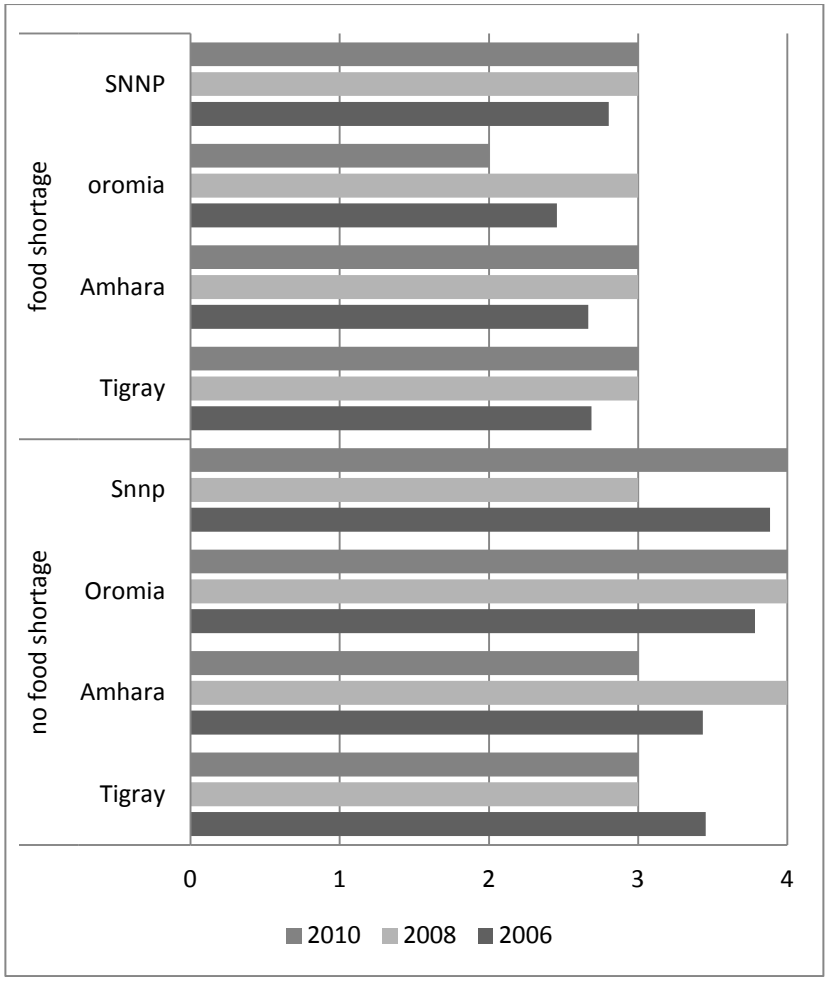


Figure 3.8b Average number of meals per day—Children

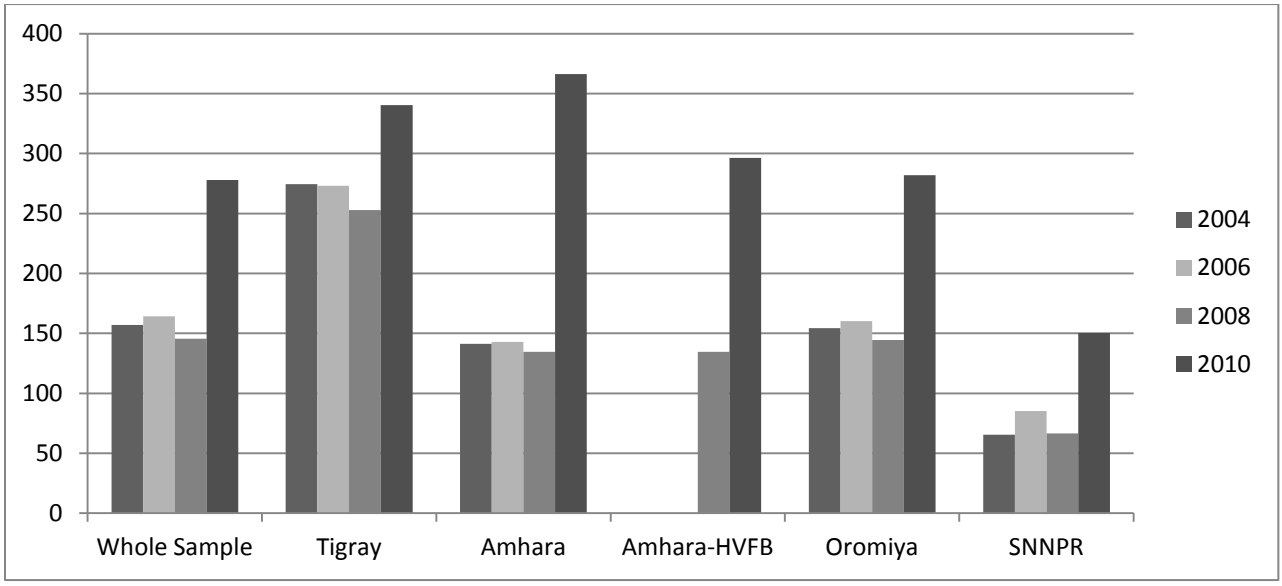


3.5 Asset Levels

Households experienced widespread drought and other weather related shocks, large increases in input prices, as well as difficulties in accessing input markets in 2010. These conditions have prevailed for most of the period since 2006 and have worsened in many cases. Such an environment is far from conducive to maintaining asset levels, let alone growth in their levels. We now turn to some trends in various types of assets held by households and the likelihood that they incurred distress sale of assets for satisfying food needs.

Figure 3.9 gives the average real value of productive assets (hoes, sickles, ploughs, water pumps, etc., but not livestock) held by households for the whole sample and by region.[5] This shows that the average value of production assets has fluctuated around 150 birr between 2004 and 2008, and then increased to 278 birr in 2010. Households in Tigray have a much higher value of production assets, but experience a steady decline from 2004 to 2008 and then a sharp rise in 2010. The average value of production assets held in Tigray in 2004 was close to 274 birr, which increased to 340 birr in 2010. All other regions had similar level of production assets in the time period under consideration with households in SNNPR with the lowest level of asset holdings. All regions experienced an increase in value of production assets in 2010.

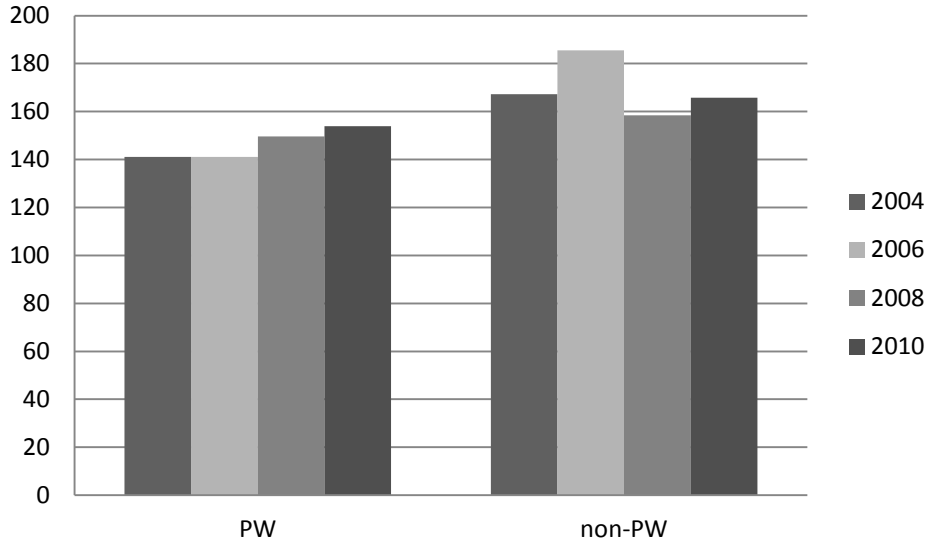
Figure 3.9 Value of production assets owned



We examine the average real value of productive assets by beneficiary status in Figure 3.10. On average, PW beneficiaries hold a lower value of production assets compared to non-beneficiaries. However, PW beneficiaries have experienced a slow and steady increase in the value of these assets, whereas the non-beneficiaries' asset growth has fluctuated.

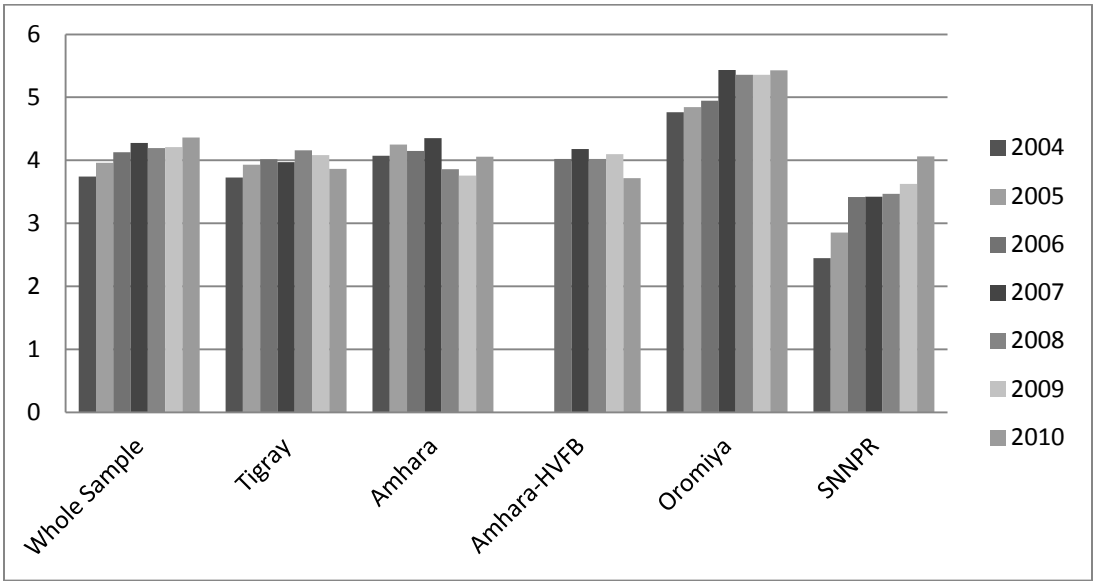
[5] We deflate nominal values with the regional CPIs published by the Central Statistical Agency, Ethiopia.

Figure 3.10 Value of production assets owned, by beneficiary status



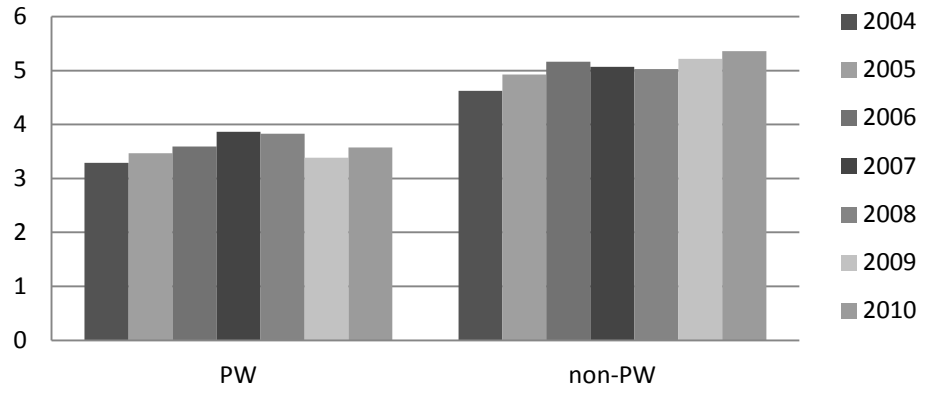
Livestock is a very important asset in rural Ethiopia. In each survey round, we asked households to give detailed livestock ownership for the survey year as well as the previous two years. We express these in terms of total tropical livestock units (TLU) held by households over the period.[6] These are presented in Figure 3.11. We observe a steady increase in TLU held by households in the sample from 2004–2007, then a slight decline in 2008, and then a rise in 2010. There are regional variations as indicated by the regional graphs. Figure 3.12 gives the average TLU held by beneficiary status. Not surprisingly, given the targeting of the PSNP, non-beneficiaries have higher livestock holdings than PW beneficiaries.

Figure 3.11 Livestock-owned Tropical Units



[6] TLUs equal 1 for cattle, horses, and mule, 0.15 for sheep and goats, 0.005 for poultry, 0.65 for donkeys, and 1.45 for camels (Ramakrishna and Demeke 2002).

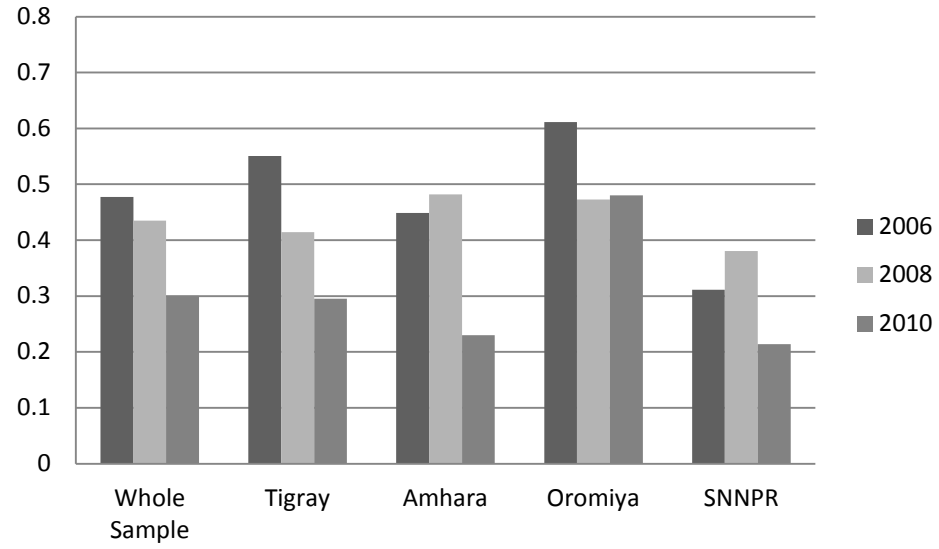
Figure 3.12 Tropical Livestock Units owned, by beneficiary status



Distress Asset Sales

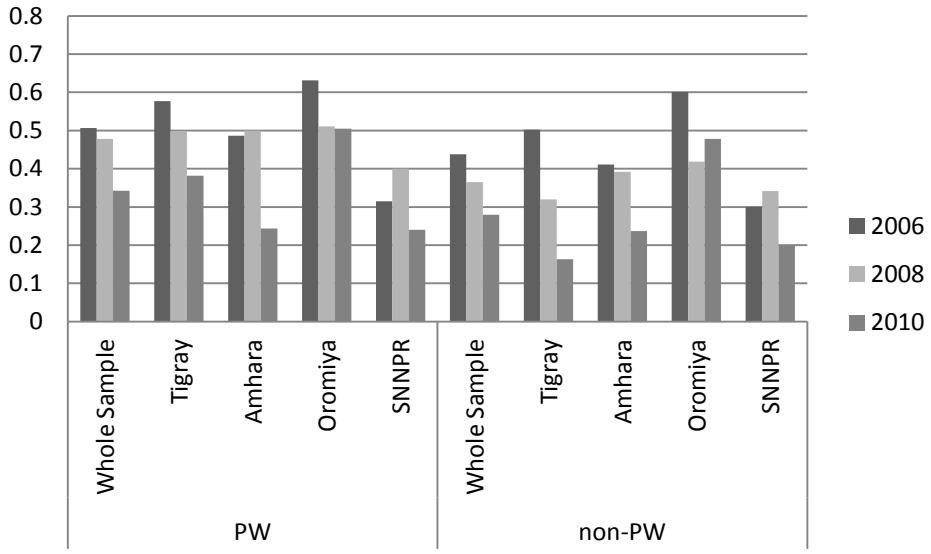
A major cause for households to draw down assets is to satisfy food needs when faced by a shock. One of the objectives of the FSP is to promote asset accumulation among its beneficiaries so that they can survive shocks, such as drought, that affect their income and agricultural output. Because these households are also the ones that are most vulnerable to shocks, asset accumulation would happen at a much slower pace as compared to non-beneficiaries that start off with a much higher base of stock of assets. The FSP, by providing a means of income during the lean season, aims to protect households from drawing down their assets in order to fulfill food needs. Figure 3.13 shows the average fraction of households that incurred distress sale of assets over the period 2006–2010. On the whole, this fraction has declined steadily from about 48 percent in 2006 to 43 percent in 2008 and 30 percent in 2010. This decline occurs across all regions albeit at different rates.

Figure 3.13 Distress sale of assets for satisfying food needs



Is there a difference between distress asset sales across PW beneficiaries and non-beneficiaries? Figure 3.14 throws some light on this question. On average, pattern of distress asset sales has been similar across rounds. PW beneficiaries started with an average fraction of 51 percent of households incurring distress sale of assets, a figure that falls steadily to 34 percent by 2010. The corresponding figures for non-beneficiary households were 44 percent in 2006 and 28 percent in 2010.

Figure 3.14 Distress sale of assets, by beneficiary status



3.6 Summary

In this chapter we examined the price trends, incidence of shocks, and summary statistics of key outcomes of interest. There are several important findings.

- Food prices have increased sharply between 2006 and 2010.
- Drought shocks are common, causing income and consumption losses.
- The incidence of shocks differs across regions, but not by beneficiary status.
- Across all households, the food gap—the number of months that the household is unable to satisfy its food needs—fell from 3.6 months to 2.3 months.
- FSP beneficiary households, on average, hold lower levels of assets compared to non-beneficiaries. This is reasonable, since the FSP beneficiaries were selected to be the more vulnerable and poor.
- Over the period 2004-2010, asset levels have increased. Although beneficiary households have not experienced accumulation of assets at a fast pace, they have shown a steady increase.
- Distress sales declined between 2006 and 2010.

Appendix 3.1 Trends in outcome variables by beneficiary status

Figure A3.1 Food Gap

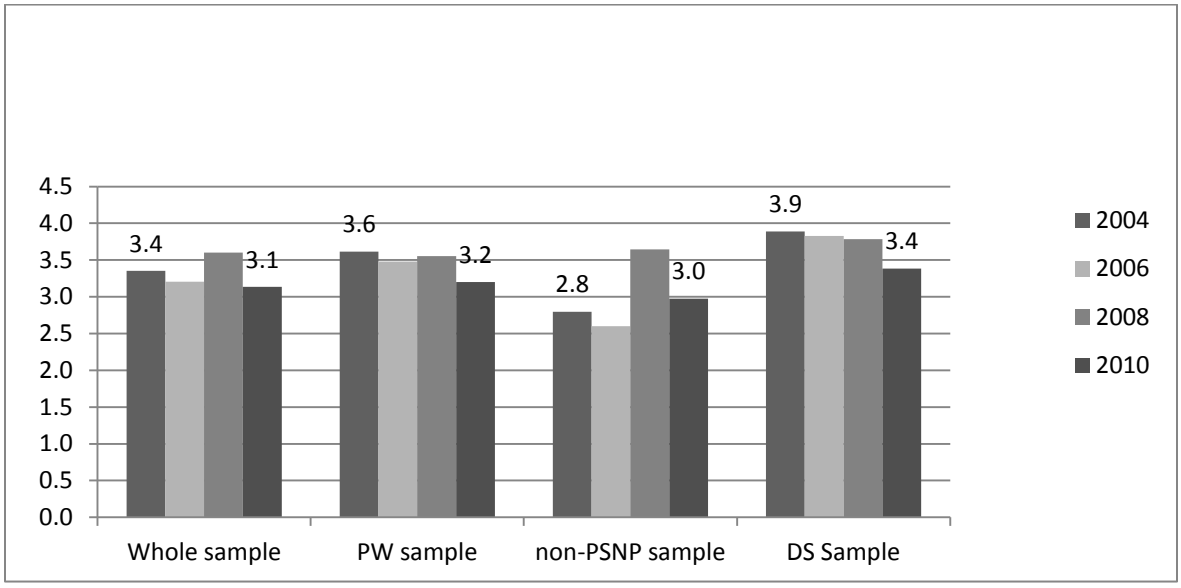


Figure A3.2 Tropical livestock units

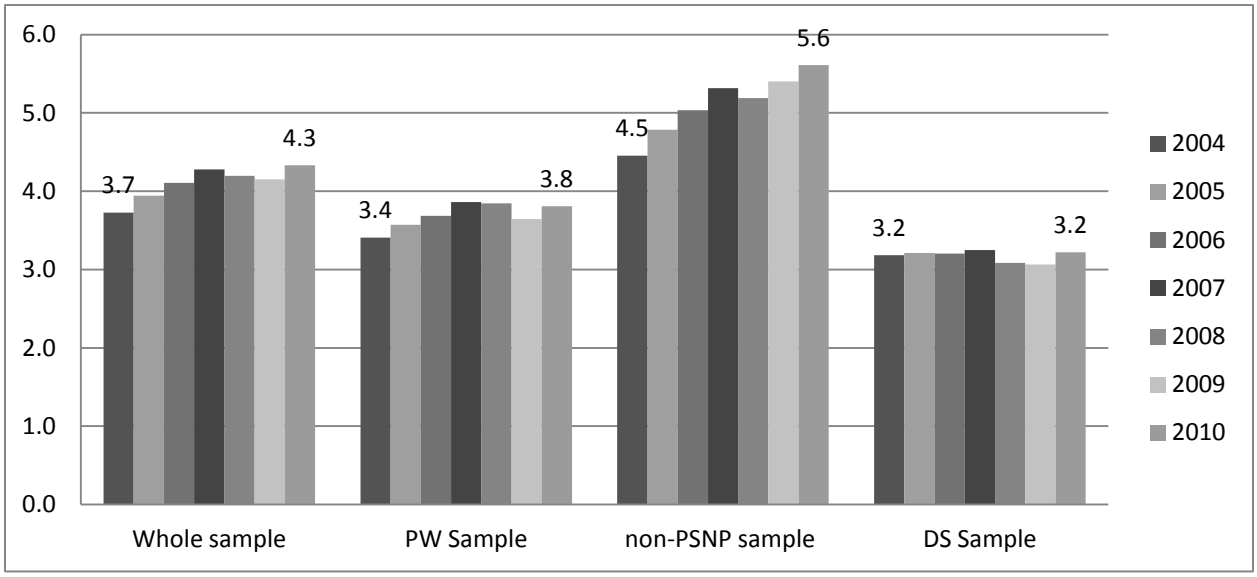


Figure A3.3 Value of production assets

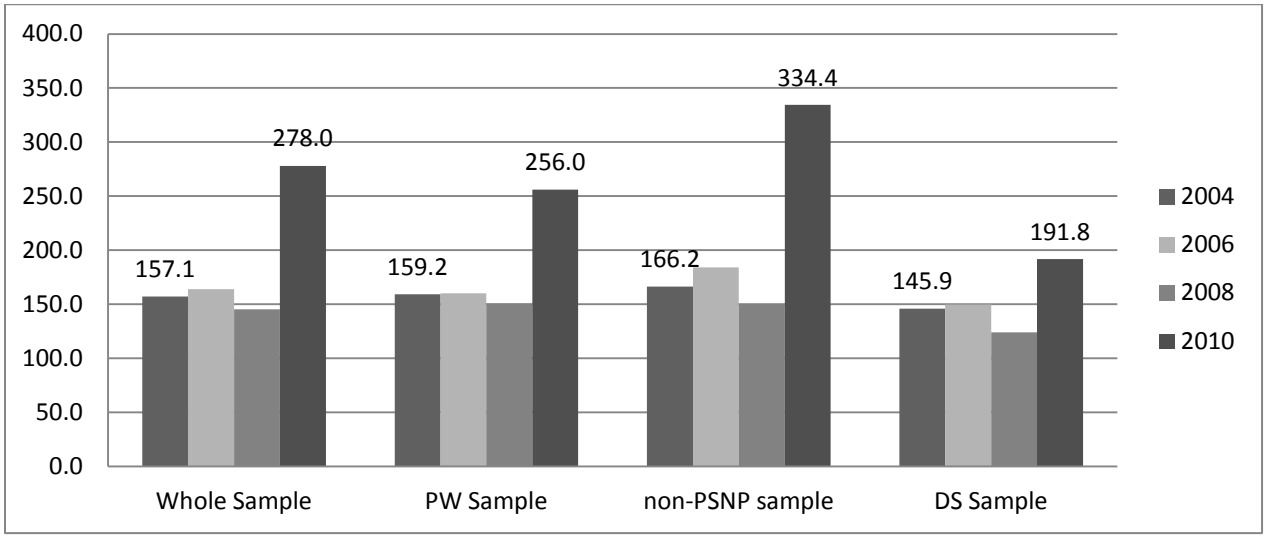
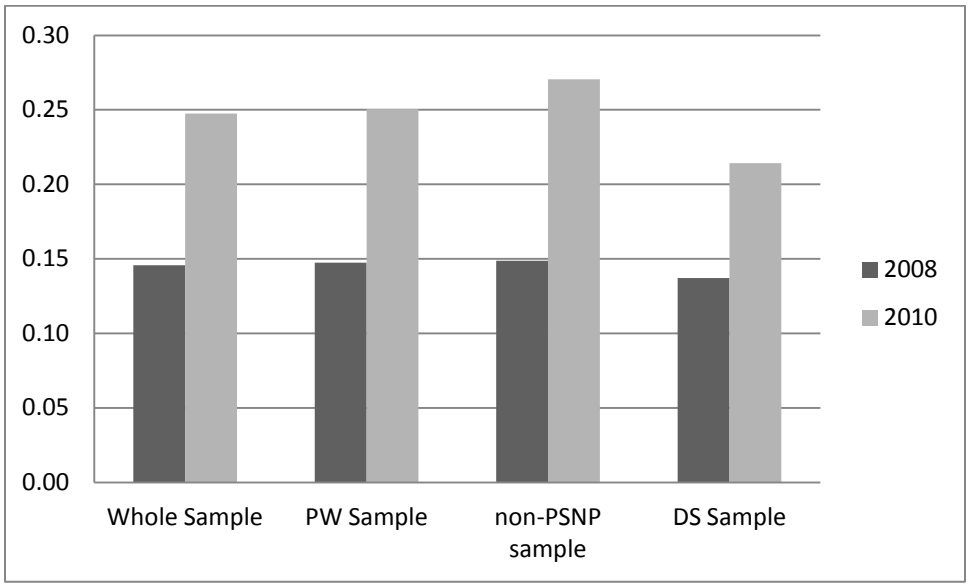


Figure A3.4 Proportion households participating in own business activities



Chapter 4: The Impact of Payments for Public Works: 2006–2010

4.1 Introduction

In this chapter, we focus on the impact of transfers received for Public Works (PW) employment between 2006 and 2010. The chapter begins by describing the payments data available to us. This section contains a considerable amount of descriptive material because, as will become clear, the measure that we use to define the extent of participation hinges on understanding a number of crucial features in these payments data. Based on this exploration, we argue that using the number of years that a household receives Public Works payments is a good representation of differences in program participation across our sample. Having established that years of participation reflect the extent of participation, we apply the dose-response methodology across the following domains: food security; assets; agricultural productivity and unintended consequences on private transfers and nonfarm own business activities. We do so for the full sample and also disaggregate by region.[7]

4.2 Public Works payment data

As described in Berhane et al. (2011), the 2006, 2008, and 2010 surveys give us payments data (both cash and in-kind) for the following periods: January–May 2006; January 2007–May 2008; and January 2009–May 2010. The community survey included a module that asked key informants to list prices of foodgrains over the previous 12 months. These data are used to value in-kind transfers. These values are added to cash payments received to generate the amount of total payments received over this period as well as telling us in which years payments were received.[8] Tables 4.1a–4.1c show how many different years beneficiaries received PW payments conditional on receiving any PW payments.

Table 4.1a Number of years households received PW payments, by region

Number of years household received PW payments	Region				
	Tigray	Amhara	Oromiya	SNNPR	Total
1	86	61	108	64	319
2	119	49	65	37	270
3	88	77	93	47	305
4	115	89	78	43	325
5	177	102	122	252	653
Total	585	378	466	443	1,872

Source: Household survey.

[7] As part of this work, we had hoped to look at disaggregations by sex of household head. However, when doing so we found that the results for female-headed households were sensitive to the matching variables that we used. Seemingly small changes in the set of matching variables could cause impact estimates to halve or double. For this reason, we have not included them here.

[8] Note that we do not have full payment data. Specifically, we are missing payment information for the periods June 2006–December 2006 and June 2008–December 2008.

Table 4.1b Number of years households received PW payments, by region, column percentages

Number of years household received PW payments	Region				Total
	Tigray	Amhara	Oromiya	SNNPR	
			(percent)		
1	26.96	19.12	33.86	20.06	100.00
2	44.07	18.15	24.07	13.70	100.00
3	28.85	25.25	30.49	15.41	100.00
4	35.38	27.38	24.00	13.23	100.00
5	27.11	15.62	18.68	38.59	100.00
Total	31.25	20.19	24.89	23.66	100.00

Source: Household survey.

Table 4.1c Number of years households received PW payments by region, row percentages

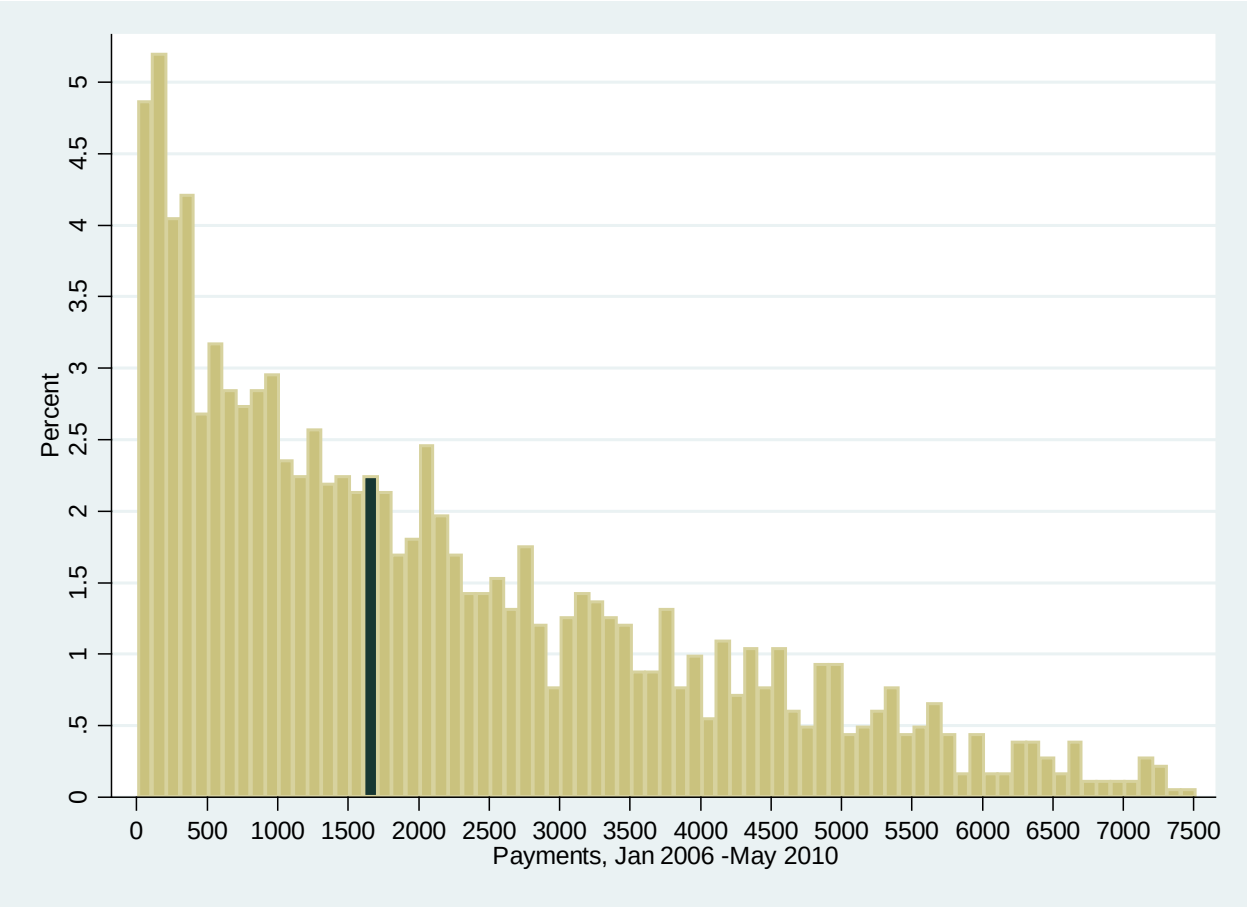
Number of years household received PW payments	Region				Total
	Tigray	Amhara	Oromiya	SNNPR	
			(percent)		
1	14.70	16.14	23.18	14.45	17.04
2	20.34	12.96	13.95	8.35	14.42
3	15.04	20.37	19.96	10.61	16.29
4	19.66	23.54	16.74	9.71	17.36
5	30.26	26.98	26.18	56.88	34.88
Total	100.00	100.00	100.00	100.00	100.00

Source: Household survey.

Table 4.1a tells us that we have 1,872 households that received payments for Public Works in at least one year between 2006 and 2010. Within the cells found in Table 4.1a, the largest number—252—represents the number of households in SNNPR who received PW payments in all five years. Table 4.1b indicates that in this sample of beneficiaries, 31.3 percent are found in Tigray, 20.2 percent reside in Amhara, 24.9 percent live in Oromiya, and 23.7 percent are located in SNNPR. For any given number of years households receive payments, at least 15 percent are found in each region, a useful feature that we return to later in this chapter. Finally, Table 4.1c indicates that 34.9 percent of households receiving any PW payments do so in all five years between 2006 and 2010. This percentage is higher in SNNPR than in other highland regions. In Tigray, Amhara, and Oromiya, there is a relatively even distribution of households across the total number of years in which they received payments.

Figure 4.1 shows the distribution of these payments, in 100 birr increments for households that received up to 7,500 birr. We exclude households receiving more than 7,500 birr; in most cases, these are households with implausibly high levels of food transfers that may have possibly resulted from a misreporting of the quantities of food or the units in which these were reported. While Figure 4.1 includes a wide range of values, the distribution is skewed to the left side of the distribution. Median transfers were 1,700 birr per beneficiary household. Relatively few—15 percent—received more than 3,500 birr.

Figure 4.1 Distribution of PW payments: January 2006–May 2010



Source: Household survey

Table 4.2 links the information found in Table 4.1 with that found in Figure 4.1. The rows refer to the number of years that a household received PW payments. The columns show the level of payments at different points in the distribution of payments for households receiving payments for one year only, for two years, and so on. For example, the number 186 in the column marked "Median" means that for households that received payments in only one year, median payments were 186 birr. The number 1,691 in the column marked "75th" means that for households that received payments in only two years, the payment level at the 75th percentile (i.e., 75 percent of these households received less than this amount and 25 percent received more) was 1,691 birr.

Table 4.2 tells us that at any point in the distribution of payments (e.g., comparing medians), households that receive more years of public works payments receive higher levels of total payments. Table 4.3 takes the data found in Table 4.2 and divides it by the number of years that the household receives payments. This allows us to compare the distribution of average payments across the differing number of years of payments. It shows clearly that households with longer exposure to the PSNP—i.e., households with more years of

participation—receive higher average payments than households with fewer years of participation.

A limitation of these payments data is that they do not take into account the fact of Full Family Targeting, after 2008 households of differing sizes had different payment entitlements. To remedy this, we calculate the percentage of entitlement that beneficiary households actually received.[9] The distribution of these percentages by number of years that a beneficiary receives PW payments is shown in Figure 4.2.

Table 4.2 Distribution of payments (birr), by number of years households receive PW payments

Number of years household received PW payments	1st	10th	25th	Median	75th	90th	99th
1	25	60	100	186	360	540	1,900
2	123	278	520	898	1,691	2,916	6,842
3	262	470	789	1,380	2,118	3,000	5,133
4	459	896	1,279	1,919	3,041	4,449	6,332
5	750	1,350	2,244	3,370	4,610	5,646	7,188
Total	51	210	630	1,650	3,180	4,783	6,800

Source: Household survey.

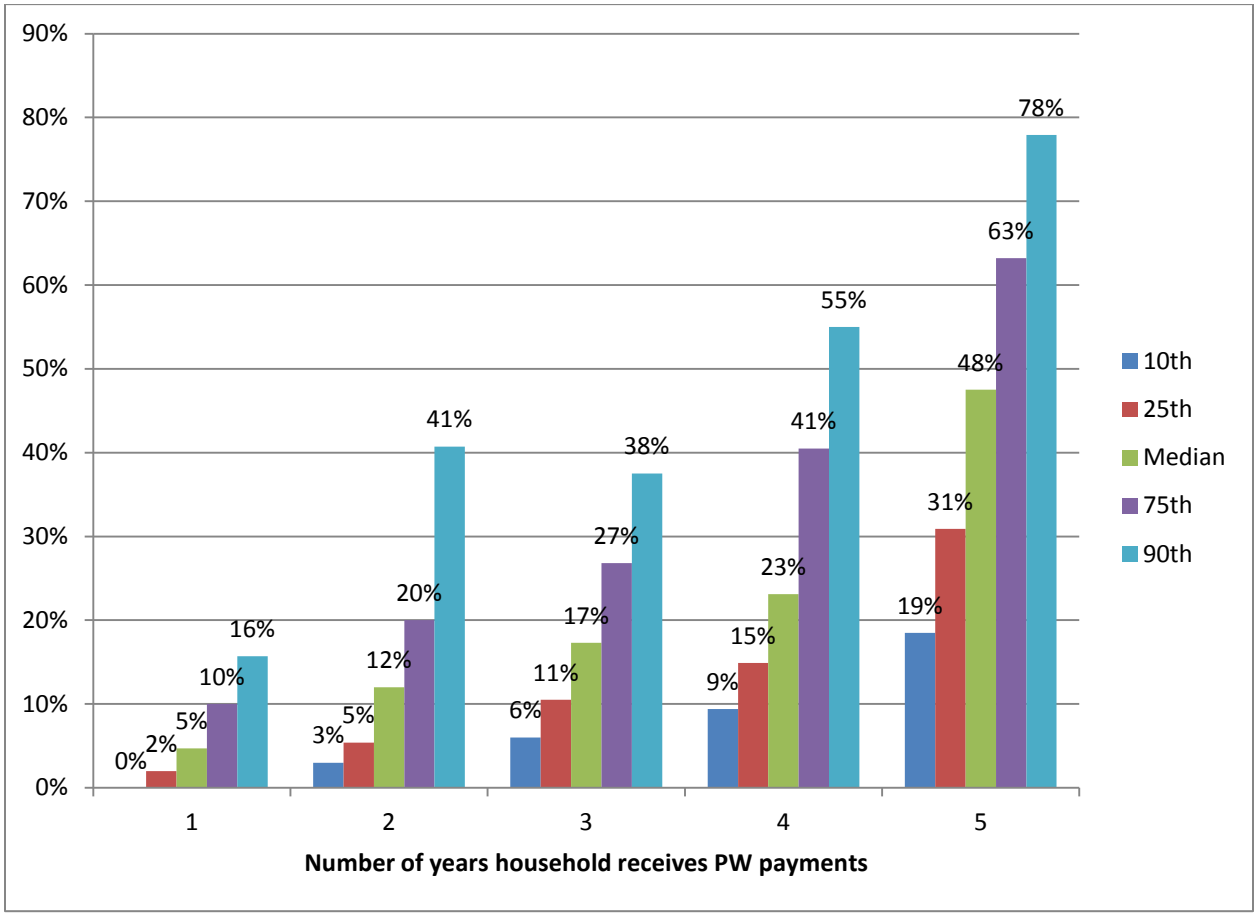
Table 4.3 Distribution of average payments (birr) per year, by number of years households receive PW payments

Number of years household received PW payments	1st	10th	25th	Median	75th	90th	99th
1	25	60	100	186	360	540	1,900
2	62	139	260	449	846	1,458	3,421
3	87	157	263	460	706	1,000	1,711
4	115	224	320	480	760	1,112	1,583
5	150	270	449	674	922	1,129	1,438
Total	40	145	263	480	778	1,086	2,117

Source: Household survey.

[9] This calculation is somewhat complex because FFT was not in place for all years, we do not have payments for the periods June–December 2006 and June–December 2008, and we only have data on payments for the first five months of 2010. Given this, we do the following. Entitlements for 2006 and 2007 are calculated as 720 birr. This is based on an assumption that a household has an entitlement of 20 days of work per month for six months at a wage of 6 birr per day (20 x 6 x 6 = 720). The entitlement for 2008 is 960 birr, 20 days of work per month for six months at a wage of 8 birr per day. For 2009, the entitlement varies by household size—it is calculated as household size multiplied by 5 days of work per month for each family member multiplied by six months multiplied by a wage of 10 birr per day. A similar calculation is used to construct entitlement for 2010 but the household entitlement figure is multiplied by 0.83 because we only observe payments in the first five months of 2010 (5/6 = 0.83). For 2007 and 2009, we have a full 12 months of payment data. For 2006 and 2008 we multiply the payment data we observe by 1/0.83 on the assumption that the payments we observe between January and June represent 5/6ths of the total payment that the household receives in that year. This figure, 1/0.83, corresponds to the modal ratio of payments that we see when we compare payments between January and May 2007 and 2009 with payments for all of 2007 and 2009, respectively.

Figure 4.2 Distribution of payments expressed as a percentage of entitlement, by number of years households receive PW payments



Source: Household survey.

Given this information, how should we measure the "dosage" of Public Works? We could use the payments data but these suffer from several problems. First, we need to deflate them, given the rapid changes in prices observed over this period and discussed in Chapter 3. While it is technically possible to construct a deflator, focusing on transfer levels does not account for the fact that some households receive infrequent, large payments while others receive smaller amounts on a more frequent basis. Also, as noted in section 4.2, we do not observe all payment levels. Finally, payment levels by themselves do not take into account the fact that different households have different entitlements.

We could focus on the number of payments that beneficiary households receive. However, doing so does not take into account differences in average payments received by different households. Measuring "dose" in terms of percent of entitlement received would seem to be promising but again recall that we do not observe all transfers. Further, it is difficult to compare these percentages when beneficiaries have differing numbers of years of participation. It is not obvious how we should compare the receipt of 40 percent of entitlement for one year compared to 10 percent for each of four years. By contrast, expressing the "dose"

in terms of the number of years that households receive Public Works payments has several attractions. First, it is in keeping with a core feature of the PSNP, namely that beneficiaries should receive multi-year program benefits. Second, as shown in Tables 4.2 and 4.3 and in Figure 4.2, the longer you receive Public Works payments, the higher the payments you get annually, the higher the average payment per year, the higher the total payment you receive, and the greater the percentage of your entitlement that you receive. For these reasons, we use number of years of receipt of Public Works payments in this chapter and also in Chapter 5.

4.3 Impact of years of Public Works participation on food security

Table 4.4 shows dose-response estimates for different years of receipt of Public Works payments on changes in the number of months that the household reports that it can meet its food needs between 2006 and 2010. Figure 4.3 graphs this dose-response function.

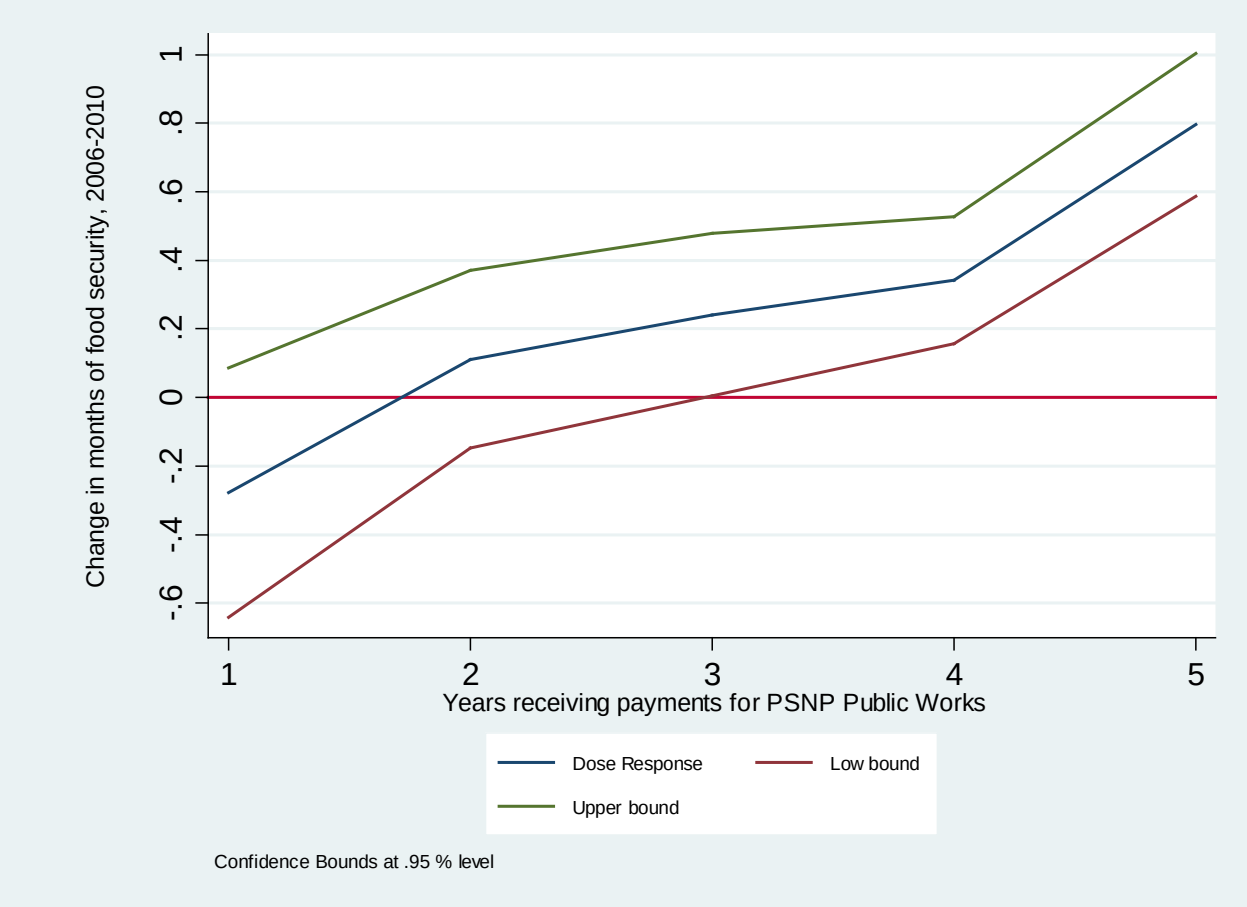
Table 4.4 Dose-response estimates of impact on months of food security of years receiving PW payments

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.250	0.150	-1.67	*
2	0.130	0.118	1.10	
3	0.210	0.107	1.96	**
4	0.380	0.082	4.63	***
5	0.801	0.086	9.31	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,512.

There are several important features of Table 4.4 and Figure 4.3. First, notice that the impact estimates are larger as the number of years of Public Works participation rises. A Public Works household that receives payments for three years has a 0.21 improvement in months of food security, or equivalently a 0.21 month reduction in the food gap. A household getting payments for four years has a 0.38 month improvement, while a household getting five years of payments shows a 0.80 month gain in food security. However, as discussed in Chapter 2, these results by themselves do not quite get at what we really would like to know—namely how do these impacts compare to what would have happened if beneficiaries had not received payments for these durations.

Figure 4.3 Dose-response function for Public Works transfers and changes in the number of months of food security, 2006–2010



The data reported in Tables 4.2 and 4.3 and in Figure 4.2 provide a clue as to how we can do so. Households that received only one year of PW payments in practice received next to nothing—the median transfer level over five years was only 186 birr and the median household that got Public Works payments for only one year obtained only 5 percent of their entitlement. By contrast, median transfers to households receiving payments in all five years were 3,370 birr, equivalent to 48 percent of their entitlement. Given these stark differences in transfer levels, and given that the median transfer to households receiving only one year of PW payments is so low, getting transfers for only one year is effectively the same as getting no transfers. But because these households were selected for the PSNP, they provide an excellent counterfactual for those who received payments for multiple years. The double difference Predicted impact for, say receiving five years of payments compared to one year (which, to reiterate is equivalent to obtaining virtually nothing) is the difference between the five-year impact estimate (0.801) and the one-year impact estimate (–0.250). This equals 1.05 months (0.80—(–0.250)). We construct a z-test statistic for this difference, which has a value of 8.60. This tells us that the impact of five years of Public Works payments, compared to receiving

(virtually) nothing, is to increase household food security by 1.05 months. Alternatively, we can say that the PSNP has reduced the food gap by 1.05 months.

Tables 4.5a–4.5d report dose-response impact estimates by region and tests whether five years receipt of Public Works payments has a larger effect than one year. This shows that provided a beneficiary receives five years of payments, there is an improvement (relative to receipt of one year of payment) in all regions and that these are all statistically significant. This improvement is 0.75 months in Tigray, 1.84 months in Amhara, 0.88 months in Oromiya, and 1.32 months in SNNPR. While households receiving five years of payments in Tigray saw their food security improve by 1.64 months, unlike other regions, even a household obtaining one year of payments saw a positive improvement in their food security and this reduces the magnitude of the double-difference impact estimate.

Table 4.5a Dose-response estimates of impact on months of food security of years receiving PW payments, Tigray

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.892	0.213	4.18	***
2	0.807	0.237	3.41	***
3	0.808	0.142	5.68	***
4	1.123	0.150	7.47	***
5	1.645	0.365	4.50	***
Difference between 5 and one years	0.75		2.52	**

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 4.5b Dose-response estimates of impact on months of food security of years receiving PW payments, Amhara

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.863	0.344	-2.51	**
2	0.162	0.188	0.86	
3	0.288	0.383	0.75	
4	0.072	0.334	0.21	
5	0.980	0.337	2.91	***
Difference between 5 and one years	1.84		5.41	**

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 4.5c Dose-response estimates of impact on months of food security of years receiving PW payments, Oromiya

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-1.143	0.488	-2.34	***
2	-0.185	0.249	-0.74	
3	0.233	0.228	1.02	
4	-0.004	0.199	-0.02	
5	-0.262	0.345	-0.76	
Difference between 5 and one years	0.88		2.08	**

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 4.5d Dose-response estimates of impact on months of food security of years receiving PW payments, SNNPR

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.910	0.344	-2.64	***
2	-0.403	0.226	-1.79	*
3	-0.086	0.237	-0.36	
4	0.070	0.187	0.37	
5	0.413	0.195	2.12	**
Difference between 5 and one years	1.32		4.37	***

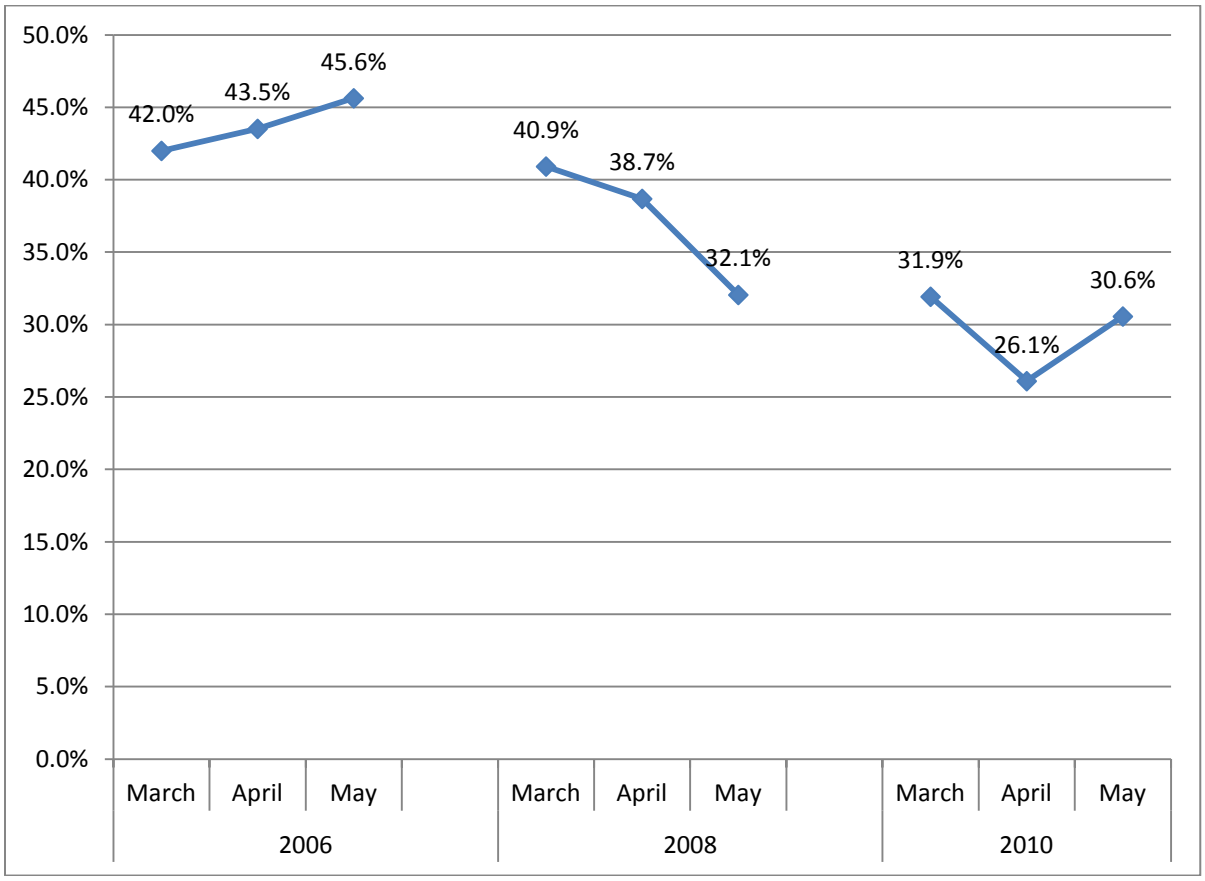
Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

A PSNP super goal is an improvement in caloric availability at the household level. Despite numerous attempts using a variety of model specifications, we can find no evidence of improvement in this outcome. Earlier evaluations of the PSNP (see Gilligan et al. 2009) noted that this outcome was highly sensitive to the receipt of payments in the months leading up to EFSS. As discussed extensively in Berhane et al. (2011), there were widespread payment delays in 2010. Figure 4.4 illustrates this, showing between 2006 and 2010, a dramatic decline in the proportion of PSNP beneficiaries receiving payments in the three months—March, April, and May—prior to the EFSS. We suspect that this decline is the cause of our failure to find an impact on this outcome.

Another possible reason why we could not find significant effects relates to measurement error. Calculating caloric availability at the household level requires respondents to accurately recall quantities of food consumed over the last seven days and the units in which these were consumed. Not only is there scope for recall error, but respondents often use nonstandard measures including *tassa*, bottles, bunches, pieces, and *small madaberia*. Errors in the conversions of these to kilograms and litres will also create measurement error in calories. One way of addressing this problem is to look at the number of different foods that a household reports consuming in the last seven days. This is less subject to measurement error and is a valid and desirable food security outcome in its own right (Hoddinott and Yohannes 2002). Table 4.6 reports dose-response estimates for the change in dietary diversity between

2006 and 2010. However, again we find no evidence of differential impacts between households receiving one and five years of Public Works employment. This suggests that it is the relatively low percentage of households receiving payments in the months prior to the survey, and not measurement error, that is the reason why we cannot find an impact on changes in caloric availability at the household level.

Figure 4.4 Percentage of public works participants receiving payments in March, April, and May, 2006, 2008, and 2010



Source: Household survey.

Table 4.6 Dose-response estimates of impact on change in diet diversity of years receiving Public Works payments

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	1.214	0.233	5.21	***
2	1.017	0.142	7.17	***
3	0.906	0.126	7.18	***
4	0.928	0.147	6.30	***
5	0.965	0.137	7.03	***
Difference between 5 and one years	-1.33		0.25	

Source: Calculated from household survey.

Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,512.

On a more positive note, the EFSS contained a range of questions on access to food—expressed in terms of the number of meals consumed daily—in both the lean and non-lean seasons. These were asked with respect to children's and adults' meal frequency. An attractive feature of this measure is that it allows us to see if, in terms of this measure of food security, there are differential program impacts within households. Table 4.7 shows dose-response estimates for the change in the number of meals children consume in the lean season between 2006 and 2010. A positive number means that, for a given number of years of participation, the number of daily meals eaten during the lean season has increased.

Table 4.7 Dose-response estimates of impact on change in number of lean-season child meals of years receiving Public Works payments

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.063	0.064	-0.98	
2	0.044	0.041	1.07	
3	-0.083	0.040	-2.08	**
4	-0.186	0.050	-3.70	***
5	0.089	0.047	1.91	*
Difference between 5 and one years	0.152		2.71	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,306.

The double-difference impact estimate is the impact of five years of Public Works participation relative to one year (which, to reiterate one more time is essentially the same as no participation). It shows that there has been a statistically significant increase of 0.152 children's meals during the lean season between 2006 and 2010. Region-specific estimates center around this figure but tend to be imprecisely measured, possibly because sample sizes are relatively small. The exception is Oromiya, where we find a 0.23 increase in meals, an impact that is statistically significant at the 10 percent level.

In this sample, meal frequency declines during the lean season compared to the non-lean season. We can think of this feature in terms of a ratio: lean season meal frequency divided by non-lean season meal frequency. An increase in this ratio between 2006 and 2010 means there is a smaller decline across seasons—in other words, less use of an undesirable food coping strategy relative to what households do when food is more plentiful. We calculate impact estimates for this ratio for both children (Table 4.8) and adults (Table 4.9).

Comparing beneficiaries receiving payments for one and five years, we see a small improvement in this ratio for children but not for adults. Region-specific results are centered around these estimates but again because of small sample sizes tend to not be statistically significant. The largest impact is found in Amhara, where the children's lean season/non-lean season ratio increases by 0.066, an improvement that is significant at the 5 percent level.

Table 4.8 Dose-response estimates of impact on change in lean season/non-lean child meals of years receiving Public Works payments

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.000	0.017	-0.03	
2	0.006	0.013	0.46	
3	-0.007	0.012	-0.60	
4	-0.010	0.011	-0.89	
5	0.029	0.013	2.16	**
Difference between 5 and one years	0.029		1.92	*

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,306.

Table 4.9 Dose-response estimates of impact on change in lean season/non-lean adult meals of years receiving Public Works payments

Number of years household received DS payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.009	0.035	-0.25	
2	-0.009	0.014	-0.61	
3	-0.011	0.014	-0.80	
4	-0.002	0.012	-0.20	
5	0.021	0.015	1.42	
Difference between 5 and one years	0.030		1.12	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,512.

4.4 Impact of years of Public Works participation on assets

Beyond the super goal of improving food security, the PSNP—particularly in conjunction with the OFSP and HABP—seeks to first stabilize and then increase asset holdings. We examine the impact of years of Public Works participation on changes in livestock holdings, expressed in Total Livestock Units (TLU) and on the value of productive assets (tools). We also assess whether there is a decline in distress sales.

Table 4.10 shows dose-response estimates of impact on changes in livestock (TLU) of years receiving Public Works payments. Table 4.11 summarizes differences in impacts between one and five years of participation by region.

Table 4.10 Dose-response estimates of impact on changes in livestock (TLU) of years receiving PW payments

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.030	0.198	0.15	
2	-0.070	0.128	-0.55	
3	0.063	0.135	0.47	
4	0.337	0.113	2.99	***
5	0.409	0.124	3.29	***
Difference between 5 and one years	0.379		2.29	**

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,205.

Table 4.11 Impact on livestock (TLU) of years receiving PW payments, by region

Number of years household received PW payments	Tigray	Amhara	Oromiya	SNNPR
Difference between 5 and one years	-0.21	1.62	-0.20	0.55
	(-0.73)	(4.44)***	(-0.60)	(2.13)**

Source: Calculated from household survey.
Notes: Z statistics in parentheses. * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,205.

Table 4.10 shows that five years participation raises livestock holdings by 0.38 TLU relative to receipt of one payment in only one year. There are substantial differences across regions. There is no impact in Tigray. This is puzzling, given the positive impact that the PSNP has on Tigrayan food security and the fact that the PSNP is well implemented in Tigray. However, when these results were discussed in Mekelle, regional PSNP representatives pointed out that they were explicitly *discouraging* PSNP beneficiaries from accumulating livestock as part of a more general effort aimed at reversing environmental degradation by the destocking of livestock. In Amhara, households receiving transfers for only one year—and again recall that these are households that essentially receive no transfers—saw their holdings fall by –1.32 TLU, while those receiving payments for all five years experienced a small increase, 0.29 animals. This leads to a 1.62 TLU impact (0.29—(–1.32)). Similarly, in SNNPR, there is an impact of 0.55 TLU.

Table 4.12 looks at the impact on changes in the value of productive assets. Households receiving payments for five years saw an increase in their holdings of these tools by 217 birr. However, a change of comparable magnitude is seen across all beneficiary households irrespective of the number of years the household received Public Works payments and as a result, the double difference impact is not statistically significant. This is also true when we disaggregate by region, with the exception of Oromiya. In Oromiya, there is an increase in the value of productive assets of 112 birr; this impact is statistically significant at the 1 percent level.

Table 4.12 Dose-response estimates of impact on changes in the value of productive assets (birr) of years receiving PW payments

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	199.4	24.9	8.00	***
2	253.0	15.8	16.02	***
3	259.9	19.0	13.66	***
4	225.7	14.1	16.04	***
5	217.8	14.9	14.63	***
Difference between 5 and one years	18.4		0.90	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,438.

We extensively explored specifications examining the impact on distress sales, but could not find any evidence of impact.

4.5 Impact of years of Public Works transfers on transfers and nonfarm own business activities

A persistent concern with social safety net interventions is that they reduce, or crowd out, informal social safety nets such as private transfers. Further, they may provide a disincentive for households to engage in new income-generating activities such as starting nonfarm own businesses. We address these concerns here.

Table 4.13 examines the impact of duration of Public Works participation on changes in net private transfers where net private transfers is the difference between transfers received from other households and those given to other households in the previous 12 months. Both cash and the value of in-kind transfers are included in this measure and we deflate net transfers received in 2010 by the CPI to take inflation into account. We find no evidence of crowding out of private transfers; in fact, there is a small—but not statistically significant—increase.

Table 4.13 Dose-response estimates of impact on change in net real private transfers (birr) of years receiving PW payments

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-10.897	17.501	-0.62	
2	8.506	16.207	0.52	
3	4.503	18.244	0.25	
4	-6.188	12.911	-0.48	
5	11.110	14.258	0.78	
Difference between 5 and one years	22.0		1.38	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,514.

Table 4.14 examines the impact of duration of Public Works participation on the probability that a household starts a nonfarm own business. We find no evidence that longer participation reduces the likelihood of entering into these activities.

Table 4.14 Dose-response estimates of impact on probability that household starts nonfarm own business of years receiving PW payments

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.167	0.027	6.10	***
2	0.128	0.014	8.92	***
3	0.121	0.016	7.53	***
4	0.152	0.016	9.30	***
5	0.180	0.017	10.69	***
Difference between 5 and one years	0.013		0.59	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,514.

4.6 Impacts in drought affected areas

Given the importance of protecting households from suffering further asset losses as a result of shocks, it is of interest to see how the PSNP has affected food security and asset holdings in localities experiencing more frequent droughts. To do so, we disaggregate the sample into two groups: households living in *woredas* where more than 50 percent of the sample reported two or more drought shocks between 2006 and 2010; and all other households. We report program impacts on the food gap and on livestock holdings. In preliminary work, we considered other outcomes but found it difficult to obtain precise estimates (Tables 4.15–4.18).

Table 4.15 Dose-response estimates of impact on months of food security of years receiving PW payments, drought affected areas

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.813	0.527	-1.544	
2	0.428	0.346	1.236	
3	0.712	0.299	2.379	**
4	0.120	0.204	0.589	
5	0.120	0.244	0.495	
Difference between 5 and one years	0.93		2.28	**

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 371.

Table 4.16 Dose-response estimates of impact on months of food security of years receiving PW payments, non-drought affected areas

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.364	0.229	-1.590	
2	0.207	0.169	1.226	
3	0.187	0.155	1.206	
4	0.219	0.146	1.505	
5	1.178	0.139	8.438	***
Difference between 5 and one years	1.54		8.13	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,141.

Table 4.17 Dose-response estimates of impact on changes in livestock (TLU) of years receiving PW payments, drought affected areas

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.129	0.300	0.431	
2	0.351	0.287	1.223	
3	0.779	0.255	3.055	***
4	0.948	0.234	4.055	***
5	0.523	0.265	1.978	**
Difference between 5 and one years	0.394		1.39	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 371.

Table 4.18 Dose-response estimates of impact on changes in livestock (TLU) of years receiving PW payments, non-drought affected areas

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.043	0.284	-0.150	
2	-0.218	0.166	-1.313	
3	-0.151	0.139	-1.086	
4	0.165	0.103	1.592	
5	0.379	0.132	2.859	***
Difference between 5 and one years	0.421		1.90	**

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,139.

Two findings emerge from these results. First, the PSNP does protect food security and asset levels in the presence of repeated shocks. Households living in areas that experienced a minimum of two droughts but also receiving PSNP payments for two or more years did not see their food security decline and households receiving four or five years of payments saw their livestock holdings increase. Second, with respect to food security, the program impacts

described in Table 4.4 are clearly dampened by these droughts. The PSNP causes food security to increase by 1.54 months in those *woredas* that were not affected by repeated droughts.

4.7 Summary of results

This chapter has considered the impact of the duration of participation in the Public Works component of the PSNP on food security and asset outcomes. It also considers whether participation duration has unintended consequences such as reducing private transfers or providing a disincentive to start nonfarm businesses. We noted that households that received payments for one year typically received only tiny amounts—the median total Public Works payment for such households over a five-year period is only 186 birr. Our impact estimates match these households to those receiving two, three, four, or five years of transfers. Taking the difference between the impact estimate of a change in an outcome for a household receiving, say, five years of payments ("with") and the impact estimate of a change in an outcome for a household receiving one year of payments (the "without" because, to reiterate, these households essentially receive nothing) yields our double-difference estimate of program impact. Calling the difference between one and five years participation as our estimate of the impact of the PSNP, we find:

- The PSNP has improved food security by 1.05 months. This impact is statistically significant.
- There is an improvement in food security (relative to receipt of one year of payment) in all regions and these are all statistically significant. This improvement is 0.75 months in Tigray, 1.84 months in Amhara, 0.88 months in Oromiya, and 1.32 months in SNNPR. While households receiving five years of payments in Tigray saw their food security improve by 1.64 months, unlike other regions, even households obtaining one year of payments saw a positive improvement in their food security and this reduces the magnitude of the double-difference impact estimate for Tigray.
- There is a statistically significant increase of 0.152 children's meals consumed during the lean season between 2006 and 2010. This increase is largest in Oromiya, where it rises by 0.23 meals.
- There is no impact on changing adult meal frequency during the lean season.
- Five years participation raises livestock holdings by 0.38 TLU relative to receipt of payments in only one year.
- There are substantial differences in the impact on livestock holdings across regions. There is no impact in Tigray. This is likely because in Tigray, beneficiaries are discouraged from accumulating livestock as part of a more general effort aimed at reversing environmental degradation.
- In Amhara, households receiving transfers for only one year saw their holdings fall by -1.32 TLU, while those receiving payments for all five years experienced a small increase,

0.29 animals. This leads to a 1.62 TLU impact. Similarly, in SNNPR, there is an impact of 0.55 TLU.

- In Oromiya, there is an increase in the value of productive assets of 112 birr; this impact is statistically significant at the 1-percent level.
- There is no evidence that the PSNP crowds out private transfers nor does it reduce the likelihood that participants start nonfarm businesses.
- Households living in areas that experienced a minimum of two droughts but also receiving PSNP payments for two or more years did not see their food security decline and households receiving four or five years of payments saw their livestock holdings increase. However, with respect to food security, the program impacts are clearly dampened by these droughts.

Chapter 5: The Joint Impact of Payments for Public Works and the Other Food Security and Household Asset Building Programs: 2006–2010

5.1 Introduction

In this chapter, we consider the joint impacts of payments for Public Works and the Other Food Security (OFSP) and Household Asset Building Programs (HABP) for the period 2006–2010. We begin by providing some background information on these programs. As we explain below, the low levels of payments made to households receiving only one year of Public Works and the (relatively) high payments made to those getting five years of payments allows us to compare households with and without the PSNP and households with and without the OFSP and HABP.

Using this approach, we first assess their joint impact on household food security. We then consider their impacts on crop production and fertilizer use before examining investments in agriculture (stone terracing, fencing, water harvesting) and new nonfarm own business activities.

5.2 The Other Food Security Program and the Household Asset Building Program[10]

In the initial phase of the Food Security Program (FSP), the PSNP was complemented by the "Other Food Security Program" (OFSP). The OFSP encompassed a suite of activities designed to support agricultural production and food security, and facilitate asset accumulation. This included access to credit, assistance in obtaining livestock, small stock or bees, tools, seeds, and assistance with irrigation or water-harvesting schemes, soil conservation, and improvements in pasture land. In some cases, beneficiaries were provided with subsidized credit to purchase "packages," combinations of agricultural inputs sometimes based on a business plan developed with support from the extension service. In the first evaluation of the FSP, Gilligan et al. (2007) noted that outside Tigray, access to the OFSP was low. While this improved between 2006 and 2008, access to the OFSP remained limited (Gilligan et al. 2009) and few households had consistent access to OFSP resources. This limited coverage reflected a number of other challenges associated with the implementation of the OFSP. One challenge was that the agricultural extension system was under resourced and there were too few DAs with sufficient skills to play their role effectively (World Bank 2010). Focus group discussions (FGD) and Key Informant Interviews (KIIs) revealed considerable regional variations in the targeting of the OFSP, partly because, at least as perceived by respondents, there were no clear guidelines on OFSP implementation, particularly who should be targeted. Further, there was confusion surrounding credit provision and repayment.

Given these problems, the Ethiopian government, in collaboration with donors and development partners, extensively redesigned the OFSP, christening the new program as the Household Assets Building Program (HABP). The HABP differs from the OFSP in three ways. Along with the injection of new resources, there is an emphasis on increased contact and

[10] This section draws heavily on Berhane et al. (2011), Chapter 10.

coordination with the extension services as well as other actors, such as the Small and Medium Enterprise Development Agency, programs for women and youth, and off-farm technical officers. Each *kebele* is to have three development agents, one crop science DA, one animal husbandry DA, and one natural resources management DA. They are supposed to disseminate "technology packages" and provide on-farm technical advice. These are demand-led with clients involved in the identification of new opportunities as well as the development of tailored business plans that can, where appropriate, include off-farm activities. Second, credit services have been de-linked from the extension service. Instead, credit will be provided through microfinance institutions (MFIs) and Rural Savings and Credit Cooperatives (RUSACCO) (GFDRE 2009b).

A third significant change has been the clarification of access to the HABP. The Government of Ethiopia (GOE) (GFDRE 2009b) states that, "The clients of the Household Asset Building component are food-insecure households in chronically food-insecure *woredas*" (GFDRE 2009b, 9). Initially, priority is to be given to expanding the coverage of the HABP component as rapidly as possible to ensure graduation at scale. For this reason, PSNP clients are to be prioritized for support under HABP.

Table 5.1, taken from Berhane et al. (2011), shows that considerable effort has been made to meet these staffing goals. There is widespread acknowledgement that this has led to an improvement in support provided by DAs. Many households report contact with Development Agents and, in particular, note that they have received advice about new crops and how crops can be grown. However, as Berhane et al. (2011) discuss, advice and assistance remain concentrated on crop production. There is limited capacity to assist nonagricultural enterprises. Access to new forms of credit, such as RUSSACOs, has been limited. Relatively few households reported borrowing money to purchase inputs or to buy livestock.

Table 5.1 Development Agent staffing at the *kebele* level

			Kebeles with a DA specialist in:				Improvement in DA support in last two years
	DA office in *kebele*	Three or more DAs	Crops	Livestock	Off-farm income	Other	
Tigray	91.7	75.7	83.3	72.2	8.3	69.4	66.7
Amhara	100.0	55.3	74.3	79.5	23.1	61.5	82.1
Amhara-HVFB	100.0	82.5	85.0	47.5	45.0	90.0	67.5
Oromiya	85.7	34.8	60.7	50.0	10.7	25.0	64.3
SNNPR	72.2	88.5	94.4	52.8	33.3	80.6	52.8

Source: *Kebele* quantitative questionnaire.
Note: All figures are percentages.

5.3 The impact of the OFSP and HABP on dimensions of food security and assets

With this background, we now consider the impact of access to the OFSP or HABP on dimensions of food security and asset holdings. We define access to these programs as follows. A household has had access to the OFSP or HABP if, in the 2006 or 2008 survey, it reported access to the OFSP in 2006, 2007, or 2008 or, if in 2010 it reported access to the HABP. Access

to the OFSP is defined as receiving advice or assistance on improved seeds, tools, irrigation, poultry or livestock, bee keeping, soil and water conservation, or credit. Access to the HABP is defined in terms of whether a household had contact with a DA, either individually or in groups. Approximately three-quarters of Public Works beneficiaries report access to the OFSP or HABP between 2006 and 2010.

Table 5.2 shows the results of estimating the dose-response model described in Chapter 2 on the subset of Public Works beneficiaries who had access to either the OFSP or HABP where impact is defined in terms of changes in the number of months the household reports being food secure. Table 5.3 shows the results of estimating this dose-response model on the subset of Public Works beneficiaries who did not have access to either the OFSP or the HABP.

Table 5.2 Dose-response estimates of impact on months of food security of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.305	0.305	-1.000	
2	0.250	0.155	1.610	
3	0.258	0.151	1.707	*
4	0.237	0.175	1.356	
5	1.080	0.179	6.029	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,205.

Table 5.3 Dose-response estimates of impact on months of food security of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.451	0.374	-1.207	
2	0.279	0.250	1.116	
3	0.039	0.259	0.152	
4	-0.268	0.180	-1.486	
5	0.468	0.312	1.501	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 340.

A casual comparison of these tables suggests that, for any number of years that the household receives PW payments, the improvement in food security is larger when the household has also received OFSP or HABP services. Consider households receiving three years of PW payments. Table 5.2 tells us that households that also received OFSP or HABP saw their food security increase by 0.258 months. Table 5.3 indicates that similar households that did not receive either OFSP or HABP saw virtually no improvement, a change of 0.039 months. Households that received five years of PW payments and access to the OFSP or HABP increased the number of months that they could satisfy their food needs by 1.08 months.

In Chapter 4, we noted that households that received only one year of PW payments in practice received next to nothing—the median transfer level over five years was only 186 birr. Median transfers to households receiving payments in all five years were 3,370 birr, equivalent to 48 percent of their entitlement. Given these stark differences in transfer levels, and given that the median transfer to households receiving only one year of PW payments is so low, here we describe those getting transfers in one year as "No PSNP," while those receiving payments for five years are called "PSNP" households. With this information and the results of Tables 5.2 and 5.3, we can construct the following categories:

(A) Households receiving PW payments for only one year and no OFSP and no HABP
"No PSNP and no OFSP/HABP"
(Results found in Table 5.3, row 1)

(B) Households receiving PW payments for five years and no OFSP and no HABP
"PSNP and no OFSP/HABP"
(Results found in Table 5.3, row 5)

(C) Households receiving PW payments for only one year but received OFSP or HABP
"No PSNP but OFSP/HABP"
(Results found in Table 5.2, row 1)

(D) Households receiving PW payments for five years and received OFSP or HABP
"PSNP and OFSP/HABP"
(Results found in Table 5.2, row 5)

By calculating the differences across these categories, we can estimate the separate impacts of the PSNP and the OFSP/HABP. For example, the difference between categories (B) and (D) captures the additional impact of the OFSP/HABP on households that receive the PSNP. Comparing (C) with (D) gives the additional impact of the PSNP on households that received the OFSP/HABP. These calculations are reported in Table 5.4.

Table 5.4 Impact of the PSNP and the OFSP/HABP on months of household food security

Difference between	Category	Impact estimate	Category	Impact estimate	Difference (months)	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	1.080	(A) No PSNP No OFSP/HABP	-0.451	(D)—(A) = 1.53	5.22	***
(D) and (B)	(D) PSNP OFSP/HABP	1.080	(B) PSNP No OFSP/HABP	0.468	(D)—(B) = 0.612	2.41	**
(D) and (C)	(D) PSNP OFSP/HABP	1.080	(C) No PSNP OFSP/HABP	-0.305	(D)—(C) = 1.38	5.53	***

Source: Calculated from Tables 5.2 and 5.3.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Based on the definitions described above, Table 5.4 provides three key results:

- Relative to having no program benefits, having the PSNP and OFSP/HABP increases foods security by 1.53 months;
- For households receiving the PSNP, the OFSP/HABP provides an increase in food security of 0.61 months; and
- For households receiving the OFSP/HABP, the PSNP increases food security by 1.38 months.

We next consider impacts on livestock and holdings of productive assets such as agricultural tools.

Tables 5.5 and 5.6 tell us that livestock holdings rise with higher number of years receiving PW payments. Table 5.7 shows that households receiving both PW payments and OFSP/HABP accumulated 1.001 TLU more than households that received neither. Table 5.10 demonstrates that households receiving both PW payments and OFSP/HABP accumulated 133.6 birr more in tools than households that received neither.

Table 5.5 Dose-response estimates of impact on livestock (TLU) of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.287	0.270	1.063	
2	0.069	0.148	0.468	
3	0.118	0.160	0.737	
4	0.375	0.122	3.061	***
5	0.404	0.099	4.073	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,205.

Table 5.6 Dose-response estimates of impact on livestock (TLU) of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.567	0.347	-1.635	
2	-0.316	0.230	-1.375	
3	-0.031	0.217	-0.141	
4	0.233	0.183	1.276	
5	0.434	0.318	1.364	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 340.

Table 5.7 Impact of the PSNP and the OFSP/HABP on livestock (TLU)

Difference between	Category	Impact estimate	Category	Impact estimate	Difference (TLU)	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	0.404	(A) No PSNP No OFSP/HABP	-0.567	(D)—(A) = 1.001	3.07	***
(D) and (B)	(D) PSNP OFSP/HABP	0.404	(B) PSNP No OFSP/HABP	0.434	(D)—(B) = 0.612	-0.03	
(D) and (C)	(D) PSNP OFSP/HABP	0.404	(C) No PSNP OFSP/HABP	0.287	(D)—(C) = 0.117	0.57	

Source: Calculated from Tables 5.5 and 5.6.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.8 Dose-response estimates of impact on productive assets (birr) of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	C	421.8	139.7	3.02	***
2		439.4	82.8	5.31	***
3		458.2	96.2	4.76	***
4		407.8	80.0	5.10	***
5	D	286.2	70.0	4.09	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 1,205.

Table 5.9 Dose-response estimates of impact on productive assets (birr) of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	A	152.6	25.7	5.95	***
2		202.3	38.8	5.21	***
3		193.3	34.5	5.61	***
4		175.3	19.6	8.92	***
5	B	212.3	39.1	5.43	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 340.

Table 5.10 Impact of the PSNP and the OFSP/HABP on productive assets (birr)

Difference between	Category	Impact estimate	Category	Impact estimate	Difference (birr)	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	286.2	(A) No PSNP No OFSP/HABP	152.6	(D)—(A) = 133.6	2.54	**
(D) and (B)	(D) PSNP OFSP/HABP	286.2	(B) PSNP No OFSP/HABP	212.3	(D)—(B) = 73.9	1.30	
(D) and (C)	(D) PSNP OFSP/HABP	286.2	(C) No PSNP OFSP/HABP	421.8	(D)—(C) = -135	1.23	

Source: Calculated from Tables 5.8 and 5.9.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

5.4 The impact of the OFSP and HABP on agricultural production, investments, and nonfarm businesses

Given the focus of the OFSP and HABP, it is of particular interest to assess its impact on farm production and agricultural investments. Because the HABP also emphasizes investments in nonfarm businesses, we also consider impact on entry into these activities. We begin by considering grain production. While it would be desirable to consider crops individually, when we attempted to do so, sample sizes were sufficiently small that it was not possible to obtain precise estimates. For this reason, we aggregate across the three most common grain crops grown by this sample: barley, wheat, and maize. We examine impacts on grain production (Tables 5.11, 5.12, and 5.13), acreage devoted to grains (Tables 5.14, 5.15, and 5.16), and yield (Tables 5.17, 5.18, and 5.19). For each outcome, we first report the dose-response estimates of years of receipt of Public Works payments for households that also receive OFSP or HABP support. We then report the dose-response estimates for those households that received neither OFSP nor HABP. Finally, using these results, we consider whether there are meaningfully larger, statistically significant impacts of access to the PSNP (i.e., using the same definitions that we used in Section 5.3) and the OFSP or HABP.

Table 5.11 Dose-response estimates of impact on grain production (kg) of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	C	-0.3	77.2	0.00	
2		21.9	42.8	0.51	
3		39.3	54.5	0.72	
4		57.3	38.8	1.48	
5	D	83.9	65.5	1.28	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.12 Dose-response estimates of impact on grain production (kg) of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	A	50.2	95.3	0.53	
2		30.6	65.4	0.47	
3		-38.6	65.5	-0.59	
4		-86.6	55.3	-1.56	
5	B	-63.1	59.1	-1.07	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.13 Impact of the PSNP and the OFSP/HABP on grain production (kg)

Difference between	Category	Impact estimate	Category	Impact estimate	Difference (kg)	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	83.9	(A) No PSNP No OFSP/HABP	50.2	(D)—(A) = 33.7	0.41	
(D) and (B)	(D) PSNP OFSP/HABP	83.9	(B) PSNP No OFSP/HABP	-63.1	(D)—(B) = 147.0	2.36	**
(D) and (C)	(D) PSNP OFSP/HABP	83.9	(C) No PSNP OFSP/HABP	-0.3	(D)—(C) = 84.2	1.18	

Source: Calculated from Tables 5.11 and 5.12.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.11 shows that, conditional on receiving OFSP or HABP services, households with longer receipt of Public Works payments have higher levels of grain production. This is not the case for households not receiving OFSP or HABP (Table 5.12), although none of these impacts are precisely measured. When we compare across categories (Table 5.13), we see that conditional on receiving the PSNP for five years, households that also had OFSP or HABP assistance produced 147 kg more of grains, and this impact is statistically significant.

Table 5.14 Dose-response estimates of impact on grain acreage (ha) of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	C	0.198	0.080	2.48	**
2		0.036	0.041	0.89	
3		-0.043	0.047	-0.91	
4		0.003	0.037	0.08	
5	D	0.042	0.041	1.02	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.15 Dose-response estimates of impact on grain acreage (ha) of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	A	0.007	0.070	0.10	
2		0.105	0.061	1.72	*
3		0.162	0.072	2.25	**
4		0.122	0.078	1.56	
5	B	0.029	0.085	0.34	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.16 Impact of the PSNP and the OFSP/HABP on grain acreage (ha)

Difference between	Category	Impact estimate	Category	Impact estimate	Difference (ha)	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	0.042	(A) No PSNP No OFSP/HABP	0.007	(D)—(A) = 0.035	0.62	
(D) and (B)	(D) PSNP OFSP/HABP	0.042	(B) PSNP No OFSP/HABP	0.029	(D)—(B) = 0.013	0.20	
(D) and (C)	(D) PSNP OFSP/HABP	0.042	(C) No PSNP OFSP/HABP	0.198	(D)—(C) = -0.16	2.46	**

Source: Calculated from Tables 5.14 and 5.15.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.17 Dose-response estimates of impact on grain yield (kg/ha) of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	C	-291.3	154.0	-1.89	*
2		49.5	115.0	0.43	
3		194.3	181.4	1.07	
4		157.3	137.8	1.14	
5	D	246.7	147.0	1.68	*

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.18 Dose-response estimates of impact on grain yield (kg/ha) of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	A	58.5	181.0	0.32	
2		13.3	138.7	0.10	
3		-114.3	113.5	-1.01	
4		-163.2	88.7	-1.84	*
5	B	-51.0	126.4	-0.40	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.19 Impact of the PSNP and the OFSP/HABP on grain yield (kg/ha)

Difference between	Category	Impact estimate	Category	Impact estimate	Difference (kg/ha)	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	246.7	(A) No PSNP No OFSP/HABP	58.5	(D)—(A) = 188.2	1.14	
(D) and (B)	(D) PSNP OFSP/HABP	246.7	(B) PSNP No OFSP/HABP	-51.0	(D)—(B) = 297.7	2.17	**
(D) and (C)	(D) PSNP OFSP/HABP	246.7	(C) No PSNP OFSP/HABP	-291.3	(D)—(C) = 537.9	3.57	***

Source: Calculated from Tables 5.17 and 5.18.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Looking at Tables 5.15 and 5.16, we see that the dose-response estimates for acreage are generally imprecisely measured. When we compare across categories (Table 5.17), we see one statistically significant difference. Conditional on receipt of OFSP/HABP, households receiving PSNP plant 0.16 less acres to grains, a small decrease. The dose-response estimates for yields are also imprecise (Tables 5.18 and 5.19). However, comparing across categories reveals large, statistically significant differences. For example, for households receiving the PSNP, also having access to the OFSP or HABP raises yields by 297 kg/ha (Table 5.19).

One reason why we might observe these impacts on output and yield relates to the possibility that access to the PSNP and/or the OFSP/HABP increases the likelihood that beneficiaries use fertilizers. Tables 5.20, 5.21, and 5.22 address this question. What is especially striking about these results is that, for any number of years of Public Works payments, the likelihood that a beneficiary uses fertilizers is higher if they also receive the OFSP or HABP. Households receiving both the PSNP and the OFSP/HABP are 21 percentage points more likely to use fertilizer than households that had neither. Among households receiving the PSNP, access to the OFSP/HABP raised the likelihood of fertilizer use by 19 percentage points. These impacts are statistically significant.

Table 5.20 Dose-response estimates of impact on probability of using fertilizer of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	C	0.411	0.038	10.92	***
2		0.360	0.027	13.22	***
3		0.370	0.026	14.49	***
4		0.424	0.022	19.20	***
5	D	0.423	0.025	17.16	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.21 Dose-response estimates of impact on probability of using fertilizer of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	A	0.209	0.054	3.83	***
2		0.199	0.030	6.72	***
3		0.240	0.025	9.46	***
4		0.269	0.027	9.82	***
5	B	0.228	0.037	6.19	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.22 Impact of the PSNP and the OFSP/HABP on probability of using fertilizer of years

Difference between	Category	Impact estimate	Category	Impact estimate	Difference	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	0.423	(A) No PSNP No OFSP/HABP	0.209	(D)—(A) = 0.214	5.08	***
(D) and (B)	(D) PSNP OFSP/HABP	0.423	(B) PSNP No OFSP/HABP	0.228	(D)—(B) = 0.195	6.24	***
(D) and (C)	(D) PSNP OFSP/HABP	0.423	(C) No PSNP OFSP/HABP	0.411	(D)—(C) = 0.012	0.37	

Source: Calculated from Tables 5.20 and 5.21.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

We now turn our attention to whether the PSNP, possibly together with the OFSP/HABP, increases the likelihood that beneficiaries make agricultural investments. Here we consider the three most frequent investments made by households in our sample: stone terracing (Tables 5.23, 5.24, and 5.25), fencing (Tables 5.26, 5.27, and 5.28), and water harvesting (Tables 5.29, 5.30, and 5.31).

All dose-response impact estimates for stone terracing are statistically significant. Apart from households receiving Public Works for only one year, the impact estimates for households receiving PSNP are always higher when they also receive OFSP or HABP services. There are positive impacts when we compare across all categories. Conditional on receiving the PSNP, access to the OFSP/HABP raises the probability of investing in stone terracing by 13 percentage points, while having access to the PSNP, conditional on access to the OFSP/HABP, raises this probability by 13.9 percentage points. It is well known in Ethiopia that stone terracing, by conserving topsoil, improves productivity. As such, these findings are consistent with our results (reported in Table 5.19) of increases in yields.

Table 5.23 Dose-response estimates of impact on probability of investing in stone terracing of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	C	0.340	0.039	8.79	***
2		0.514	0.021	25.06	***
3		0.543	0.025	22.00	***
4		0.452	0.025	18.25	***
5	D	0.479	0.023	20.60	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.24 Dose-response estimates of impact on probability of investing in stone terracing of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	A	0.419	0.053	7.94	***
2		0.443	0.038	11.71	***
3		0.421	0.035	12.17	***
4		0.373	0.035	10.78	***
5	B	0.349	0.047	7.49	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.25 Impact of the PSNP and the OFSP/HABP on probability of investing in stone terracing

Difference between	Category	Impact estimate	Category	Impact estimate	Difference	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	0.479	(A) No PSNP No OFSP/HABP	0.419	(D)—(A) = 0.060	1.47	
(D) and (B)	(D) PSNP OFSP/HABP	0.479	(B) PSNP No OFSP/HABP	0.349	(D)—(B) = 0.130	3.52	***
(D) and (C)	(D) PSNP OFSP/HABP	0.479	(C) No PSNP OFSP/HABP	0.340	(D)—(C) = 0.139	4.36	***

Source: Calculated from Tables 5.23 and 5.24.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Dose-response estimates for the impact on the probability of investing in fencing are all well measured. In both Tables 5.26 and 5.27, this probability raises with more years of Public Works payments. Having both PSNP payments and OFSP/HABP services raises the likelihood of investing in fencing by 22.6 percentage points relative to households who have neither. Conditional on access to the OFSP/HABP, the PSNP raises this likelihood by 16.4 percentage points, while conditional on access to the PSNP, access to the OFSP/HABP raises it by 7.9 percentage points. This is consistent with synergistic effects of both programs—the OFSP/HABP provides technical assistance, while the PSNP provides the financial resources necessary for this investment.

Table 5.26 Dose-response estimates of impact on probability of investing in fencing of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	C	0.319	0.037	8.67	***
2		0.373	0.027	13.60	***
3		0.330	0.027	12.38	***
4		0.313	0.024	12.84	***
5	D	0.484	0.027	17.67	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.27 Dose-response estimates of impact on probability of investing in fencing of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	A	0.257	0.048	5.41	***
2		0.257	0.025	10.46	***
3		0.334	0.028	11.72	***
4		0.417	0.033	12.76	***
5	B	0.404	0.051	7.86	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.28 Impact of the PSNP and the OFSP/HABP on probability of investing in fencing

Difference between	Category	Impact estimate	Category	Impact estimate	Difference	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	0.484	(A) No PSNP No OFSP/HABP	0.257	(D)—(A) = 0.226	5.83	***
(D) and (B)	(D) PSNP OFSP/HABP	0.484	(B) PSNP No OFSP/HABP	0.404	(D)—(B) = 0.079	1.92	*
(D) and (C)	(D) PSNP OFSP/HABP	0.484	(C) No PSNP OFSP/HABP	0.319	(D)—(C) = 0.164	5.06	***

Source: Calculated from Tables 5.26 and 5.27.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.29 Dose-response estimates of impact on probability of investing in water harvesting of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	C	0.016	0.008	2.03	**
2		0.043	0.012	3.58	***
3		0.055	0.013	4.19	***
4		0.032	0.007	4.64	***
5	D	0.023	0.007	3.33	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.30 Dose-response estimates of impact on probability of investing in water harvesting of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	A	0.009	0.007	1.42	
2		0.025	0.011	2.30	**
3		0.041	0.015	2.78	***
4		0.040	0.014	2.74	***
5	B	0.031	0.014	2.32	**

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.31 Impact of the PSNP and the OFSP/HABP on probability of investing in water harvesting

Difference between	Category	Impact estimate	Category	Impact estimate	Difference	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	0.023	(A) No PSNP No OFSP/HABP	0.009	(D)—(A) = 0.014	2.02	**
(D) and (B)	(D) PSNP OFSP/HABP	0.023	(B) PSNP No OFSP/HABP	0.031	(D)—(B) = -0.008	-0.79	
(D) and (C)	(D) PSNP OFSP/HABP	0.023	(C) No PSNP OFSP/HABP	0.016	(D)—(C) = 0.007	0.90	

Source: Calculated from Tables 5.29 and 5.30.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

In general, dose response, while precisely estimated, is small in magnitude and so the differences across categories also tend to be small. While having both the PSNP and the OFSP/HABP has a statistically significant impact on investing in water harvesting, compared to households that received neither, the difference is only 1.4 percentage points.

Finally, we consider whether access to the OFSP and HABP increases the likelihood that beneficiaries diversify into new nonfarm business activities. Tables 5.32 and 5.33 show precise estimates at different dose levels but there is no meaningful differences in these estimates. Consequently, when we compare across categories (Table 5.34), the magnitudes of the differences are small and not statistically significant.

Table 5.32 Dose-response estimates of impact on probability of starting own nonfarm business of years receiving PW payments for households receiving either OFSP or HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	C	0.194	0.036	5.35	***
2		0.112	0.019	5.89	***
3		0.087	0.016	5.33	***
4		0.131	0.017	7.93	***
5	D	0.195	0.021	9.32	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.33 Dose-response estimates of impact on probability of starting own nonfarm business of years receiving PW payments for households receiving neither OFSP nor HABP support

Number of years household received PW payments	Group	Predicted impact	Standard error	T statistic	Statistical significance
1	A	0.166	0.048	3.47	***
2		0.166	0.025	6.51	***
3		0.176	0.027	6.49	***
4		0.207	0.028	7.41	***
5	B	0.250	0.049	5.12	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

Table 5.34 Impact of the PSNP and the OFSP/HABP of starting own nonfarm business of years

Difference between	Category	Impact estimate	Category	Impact estimate	Difference	Z statistic on difference	Statistical significance
(D) and (A)	(D) PSNP OFSP/HABP	0.195	(A) No PSNP No OFSP/HABP	0.166	(D)—(A) = 0.029	0.79	
(D) and (B)	(D) PSNP OFSP/HABP	0.195	(B) PSNP No OFSP/HABP	0.250	(D)—(B) = -0.008	-1.48	
(D) and (C)	(D) PSNP OFSP/HABP	0.195	(C) No PSNP OFSP/HABP	0.194	(D)—(C) = 0.007	0.03	

Source: Calculated from Tables 5.32 and 5.33.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level.

5.5 Summary

This chapter has considered the joint impacts of payments for Public Works and the Other Food Security (OFSP) and Household Asset Building Programs (HABP) for the period 2006–2010. An important feature of our evaluation design is the fact that low levels of payments made to households receiving only one year of Public Works and the (relatively) high payments made to those getting five years of payments allows us to compare households with and without the

PSNP and households with and without the OFSP and HABP. Using this approach, we find the following:

- Relative to having no program benefits, having the PSNP and OFSP/HABP increases foods security by 1.53 months.
- For households receiving the PSNP, the OFSP/HABP provides an increase in food security of 0.61 months.
- For households receiving the OFSP/HABP, the PSNP increases food security by 1.38 months.
- The joint receipt of the PSNP and OFSP/HABP leads to the accumulation of 1.001 TLU more than households that received neither. Households receiving both PSNP and OFSP/HABP accumulated 133.6 birr more in tools than households that received neither.
- Conditional on receiving the PSNP for five years, households that also had OFSP or HABP assistance produced 147 kgs more of grains. There is no impact of the PSNP and/or the HABP on acreage. Households receiving the PSNP, also having access to the OFSP or HABP, obtained yields that were 297 kg/ha higher than those households that only received the PSNP.
- These impacts on output and yields are consistent with the effects of the OFSP/HABP on fertilizer use and investments in stone terracing. Both are yield enhancing. We find that, conditional on receipt of the PSNP, access to the OFSP/HABP raises the likelihood of using fertilizer by 19.5 percentage points and the probability of investing in stone terracing by 13 percentage points.
- Having both PSNP payments and OFSP/HABP services raises the likelihood of investing in fencing by 22.6 percentage points relative to households who have neither. Conditional on access to the OFSP/HABP, the PSNP raises this likelihood by 16.4 percentage points, while conditional on access to the PSNP, access to the OFSP/HABP raises it by 7.9 percentage points. This is consistent with synergistic effects of both programs—the OFSP/HABP provides technical assistance, while the PSNP provides the financial resources necessary for this investment.

Chapter 6: The Impact of Payments for Direct Support: 2006–2010

6.1 Introduction

Direct Support payments to food insecure households that are unable to provide labor for public works are important components of the PSNP. Previous impact evaluations (Gilligan, Hoddinott, and Taffesse [2007] and Gilligan et al. [2009b]) of the PSNP have not been able to assess their impact using propensity score or nearest neighbor matching methods. There had simply not been enough households in the EFSS that have the characteristics of those receiving Direct Support and receive neither Direct Support transfers nor Public Works payments to construct a matched comparison group. However, three rounds of data together with the application of the Hirano-Imbens method of estimating dose-response makes it possible to do so here. We assess the cumulative effect of Direct Support payments received since the inception of the PSNP.

The chapter begins by describing the Direct Support payments data available to us. Using the methods described in Chapter 2, we first assess the impact of Direct Support on measures of food security. We then consider their impact on livestock holdings, the value of productive assets, private transfers and the likelihood of starting nonfarm own businesses.

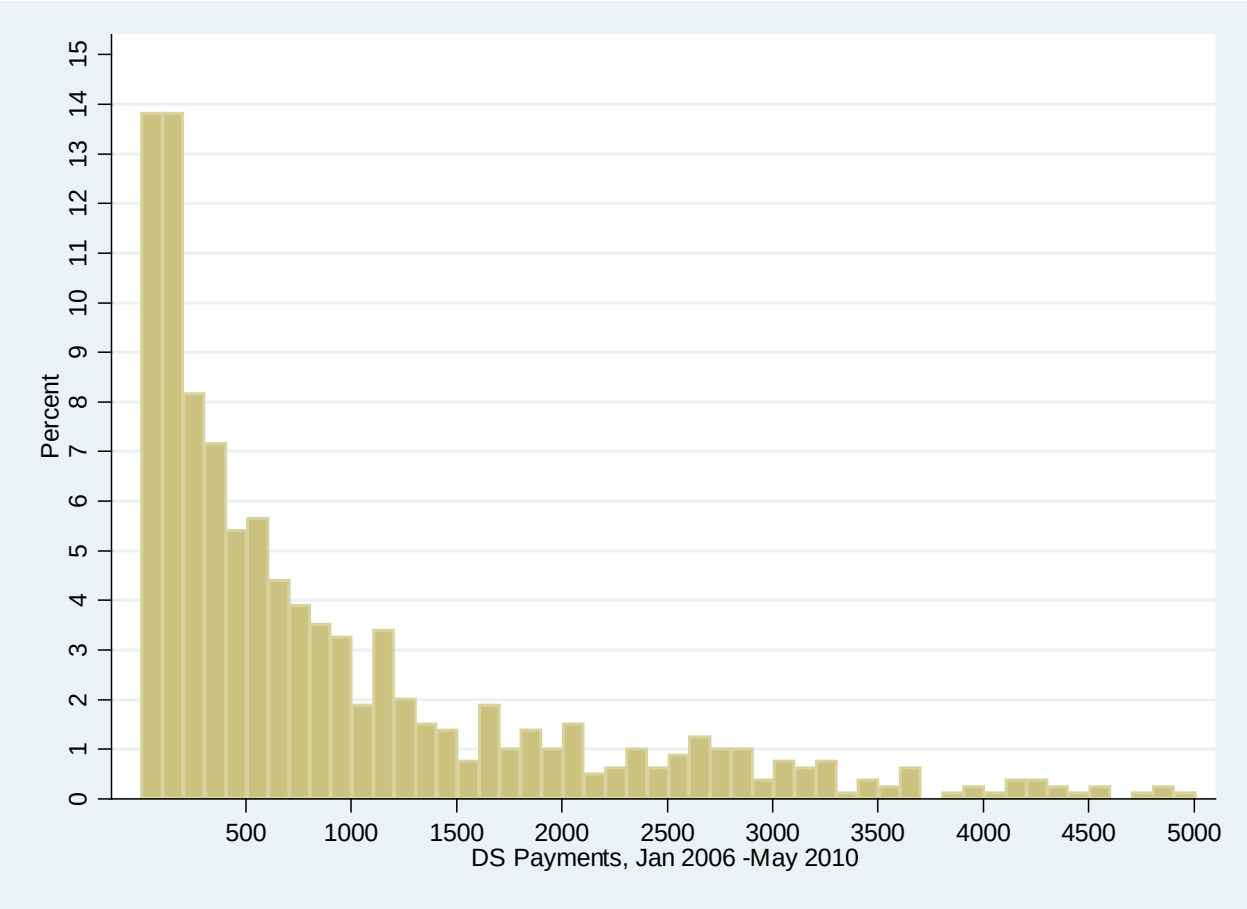
6.2 Direct Support payment data

The 2006, 2008, and 2010 surveys give us Direct Support payments data (cash and in-kind) for the following periods: January–May 2006; January 2007–May 2008; and January 2009–May 2010. The community survey included a module that asked key informants to list prices of foodgrains over the previous 12 months. These data are used to value in-kind payments. These values are added to cash payments received to generate the amount of total Direct Support payments received over this period.[11]

Figure 6.1 shows the distribution of these Direct Support payments, in 100 birr increments for households that received between 100 and 6,000 birr. We exclude the 22 households that receive more than 6,000 birr. In most cases, these are households with implausibly high levels of food transfers that may have possibly resulted from a misreporting of the quantities of food or the units in which these were reported. While Figure 6.1 includes a wide range of values, the distribution is severely skewed to the left side of the distribution with 30 percent of Direct Support beneficiaries receiving less than 200 birr. Median Direct Support payments over the full five-year period are 564 birr.

[11] Note that we do not have full payment data. Specifically, we are missing payment information for the periods June 2006–December 2006 and June 2008–December 2008.

Figure 6.1 Distribution of Direct Support payments: January 2006–May 2010



Source: Household survey

Next, we examine the distribution of the value of these payments by number of years households receive Direct Support. The distribution of total DS payments is shown in Table 6.1; the distribution of average DS payments is shown in Table 6.2.

Table 6.1 Distribution of total payments (birr) by number of years households receive Direct Support transfers

Number of years household received DS transfers	1st	10th	25th	Median	75th	90th	99th	Sample size
1	10	45	86	160	300	582	2,480	272
2	72	142	335	636	1,213	2,316	4,404	246
3	150	213	441	798	1,560	2,363	4,040	126
4	195	424	705	1,785	2,790	3,464	4,943	85
5	537	747	1,035	1,727	3,000	4,087	5,181	70
Total	25	90	180	540	1,250	2,604	4,603	799

Source: Household survey.

Table 6.2 Distribution of average payments (birr) by number of years households receive Direct Support transfers

Number of years household received DS transfers	1st	10th	25th	Median	75th	90th	99th	Sample size
1	10	45	86	160	300	582	2,480	272
2	36	71	168	318	606	1,158	2,202	246
3	50	71	147	266	520	788	1,347	126
4	49	106	176	446	698	866	1,236	85
5	107	149	207	345	600	817	1,036	70
Total	25	90	180	540	1,250	2,604	4,603	799

Source: Household survey.

Table 6.1 indicates that households receiving Direct Support payments for more years generally have higher total payments. However, unlike the pattern observed in Chapter 4, there are exceptions. For example, a household at the 90th percentile of DS recipients who received transfers for only one year received higher payments than a household at the 25th percentile of DS recipients receiving payments for three years (582 vs 441). This observation is reinforced by Table 6.2 which looks at average payments. While it is generally true that average payments are higher for beneficiaries receiving DS payments for more (rather than fewer) years, again this pattern is not uniform.

6.3 Impact of Direct Support payments on food security

We begin by looking at the impact of Direct Support payments on changes in the food gap between 2006 and 2010. In initial estimates, we experimented with using access to these payments over all five years. This produced imprecise impact estimates. However, as seen in Table 6.1, we have few households receiving transfers for four or five years. Consequently, we merge them into the group of households receiving Direct Support for three years. Figure 6.2 shows the dose-response function for one, two, and three or more years receiving Direct Support transfers and changes in the number of months of food security between 2006 and 2010.

Recall that a positive change in the number of months that the household is food-secure means that the household is more food-secure in 2010 than it was in 2006. Put another way, an increase of 0.5 months in the number of months that the household reports that it can meet the food needs of the household is equivalent to a reduction of 0.5 months in the food gap. Where the teal (lower-bound) line lies above the horizontal red line running through zero, Direct Support transfers have a statistically significant impact on household food security. In Figure 6.2, this is true for households receiving two, three, or three or more years of Direct Support but not for households who received it only for one year. Table 6.3 summarizes these same results in tabular form, showing the predicted level of impact, and their associated t statistics.

Figure 6.2 Dose-response function for Direct Support payments and changes in the food gap, 2006-2010

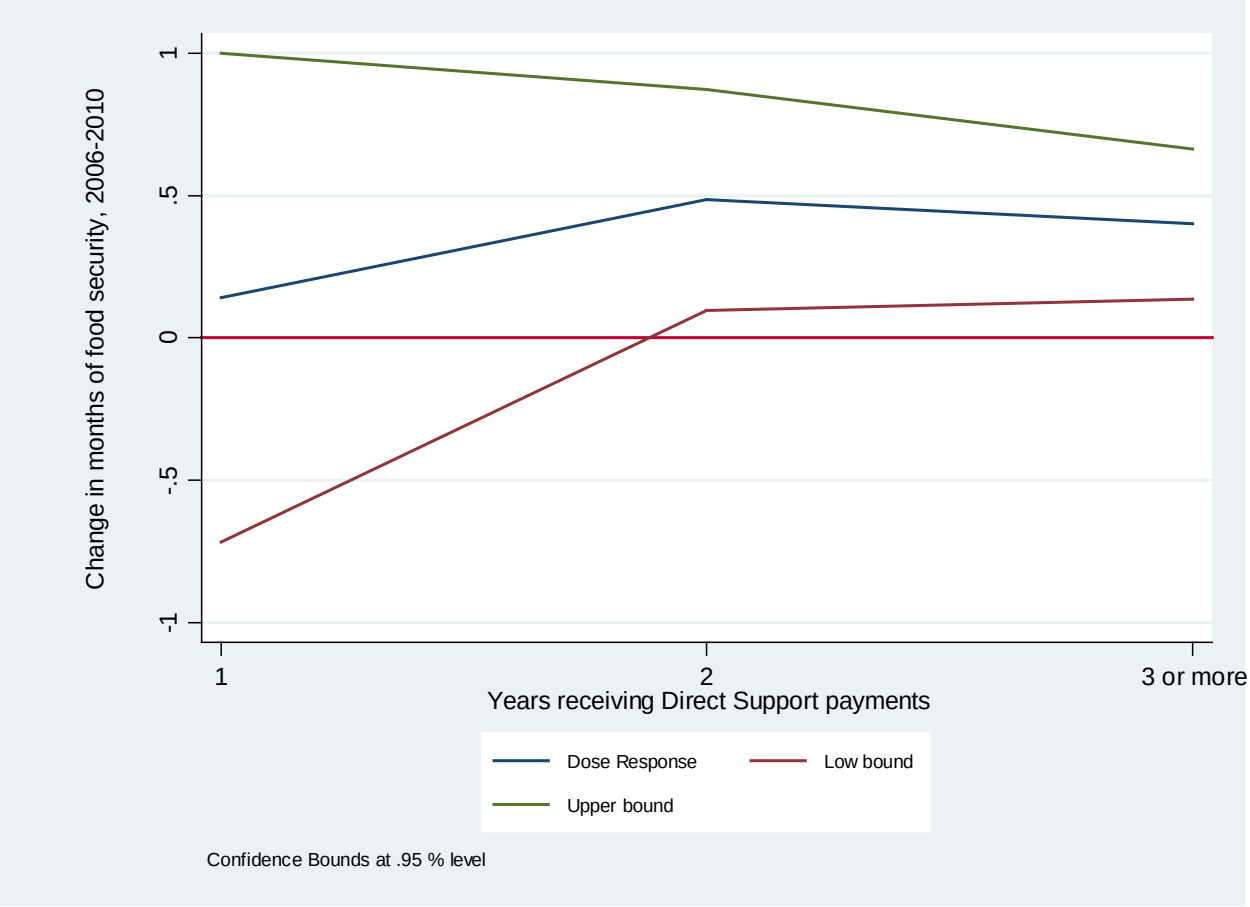


Table 6.3 Dose-response estimates of impact on months of food security of years receiving Direct Support transfers

Number of years household received DS payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.141	0.438	0.321	
2	0.486	0.198	2.453	**
3	0.400	0.135	2.965	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Table 6.3 along with Figure 6.2 indicates that households who received Direct Support payments for at least three years saw their food security increase by 0.40 months. However, we cannot reject the null hypothesis that more years of Direct Support have a larger impact than fewer years. This is not entirely surprising, given Table 6.3—there are a sufficient number of DS households in the sample who have high-ish average payments but few number of years of

payment receive and vice versa. Given this, we try another dose-response model where the "dose" is expressed in terms of average payments. Results are shown in Table 6.4.

Table 6.4 Dose-response estimates of impact on months of food security of average Direct Support transfers

Average Direct Support transfers	Predicted impact	Standard error	T statistic	Statistical significance
500	0.437	0.222	1.97	**
1,500	0.762	0.665	1.15	
2,500	2.513	1.228	2.05	**

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Here we see that higher average Direct Support payments lead to greater improvements in food security. Further, when we test for differences in these impacts, we find that we can reject the null hypothesis that the impacts of 500 and 2,500 average DS transfers are equal; the difference between them is large, 2.08 months, and is statistically significant. Unfortunately, however, there are few Direct Support beneficiaries receiving such large levels of average transfers.

We now apply this approach, looking at the impact of years of Direct Support receipt and average Direct Support payments on changes in a range of additional food security outcomes over the period 2006 and 2010. These are changes in the ratio of lean season/non-lean child meals (Tables 6.5 and 6.6), the ratio of lean season/non-lean child meals (Tables 6.7 and 6.8), and changes in diet diversity (Tables 6.9 and 6.10). Across these three food security outcomes, we are looking to see if there is evidence of statistically significant impacts of different "dose" levels, whether these increase with higher doses (either years or average transfer) and whether we observe comparable patterns when using either years of receipt of Direct Support or average Direct Support transfer levels.

Table 6.5 Dose-response estimates of impact on change in lean season/non-lean child meals of years receiving Direct Support transfers

Number of years household received DS payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.017	0.023	0.76	
2	-0.009	0.009	-0.93	
3	-0.007	0.018	-0.37	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Table 6.6 Dose-response estimates of impact on change in lean season/non-lean child meals of average Direct Support transfers

Average Direct Support transfers	Predicted impact	Standard error	T statistic	Statistical significance
500	0.026	0.019	1.38	
1,500	0.051	0.057	0.91	
2,500	0.130	0.118	1.10	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Table 6.7 Dose-response estimates of impact on change in lean season/non-lean adult of years receiving Direct Support transfers

Number of years household received DS payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.009	0.027	0.33	
2	-0.026	0.004	-7.27	***
3	-0.017	0.018	-0.91	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Table 6.8 Dose-response estimates of impact on change in lean season/non-lean children's meals of average Direct Support transfers

Average Direct Support transfers	Predicted impact	Standard error	T statistic	Statistical significance
500	0.037	0.021	1.78	*
1500	-0.059	0.070	-0.84	
2500	-0.091	0.154	-0.59	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Table 6.9 Dose-response estimates of impact on change in diet diversity of years receiving Direct Support transfers

Number of years household received DS payments	Predicted impact	Standard error	T statistic	Statistical significance
1	1.044	0.251	4.16	***
2	0.861	0.190	4.55	***
3	0.643	0.281	2.29	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Table 6.10 Dose-response estimates of impact on change in diet diversity of average Direct Support transfers

Average Direct Support transfers	Predicted impact	Standard error	T statistic	Statistical significance
500	0.825	0.217	3.80	***
1500	0.600	0.643	0.93	
2500	0.154	1.339	0.11	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

The striking feature across these six tables is the absence of dose response. There is not a consistent pattern of increases and when we test for statistically significant differences, we cannot reject the null hypothesis that these impacts are equal.[12]

6.4 Impact of Direct Support payments on assets, private transfers, and nonfarm own business activities

We now consider whether Direct Support beneficiaries were able to, over the period 2006 to 2010, accumulate livestock and productive assets (Tables 6.11—6.14), whether their payments crowded out private transfers (Tables 6.15 and 6.16), and whether they were more likely to start nonfarm own business (Tables 6.17 and 6.18).

Table 6.11 Dose-response estimates of impact on change in livestock holdings (TLU) of years receiving Direct Support transfers

Number of years household received DS payments	Predicted impact	Standard error	T statistic	Statistical significance
1	-0.014	0.168	-0.08	
2	0.087	0.102	0.85	
3	-0.082	0.149	-0.55	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Table 6.12 Dose-response estimates of impact on change in livestock holdings (TLU) of average Direct Support transfers

Average Direct Support transfers	Predicted impact	Standard error	T statistic	Statistical significance
500	-0.142	0.152	-0.93	
1,500	0.958	0.617	1.55	
2,500	1.921	1.078	1.78	*

Source: Calculated from household survey.

[12] As with the results on PW payments, there are relatively low percentages of DS beneficiaries receiving payments in the months between March and May. These were: 35, 39 and 45 percent in March, April and May, 2006 respectively; 37, 25 and 26 percent in March, April and May, 2008; and 48, 47 and 60 percent in March, April and May, 2010. Only 21 percent (76 households) received payments in March, April and May 2010.

Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Table 6.13 Dose-response estimates of impact on change in productive assets (birr) of years receiving Direct Support transfers

Number of years household received DS payments	Predicted impact	Standard error	T statistic	Statistical significance
1	157	64	2.44	**
2	213	35	6.04	***
3	325	117	2.77	**

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

Table 6.14 Dose-response estimates of impact on change in productive assets (birr) of average Direct Support transfers

Average Direct Support transfers	Predicted impact	Standard error	T statistic	Statistical significance
500	164	34	4.82	***
1,500	568	346	1.64	*
2,500	838	610	1.37	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 514.

There is unambiguous evidence of impact on the accumulation of productive assets, measured in nominal birr. This is true whether we assess impact using years of receipt or average transfers. The differences between receiving one and three years of transfers is statistically significant at the 10-percent level. When we look at the livestock results, we see that higher average transfers lead to faster livestock accumulation. The difference in impact between 500 and 2,500 birr is large, nearly two TLU and statistically significant. However, we do not see the same pattern of results when we use year of receipt as the dose measure.

Table 6.15 Dose-response estimates of impact on change in net real private transfers (birr) of years receiving Direct Support transfers

Number of years household received DS payments	Predicted impact	Standard error	T statistic	Statistical significance
1	27	19	1.47	
2	22	11	1.97	**
3	3	16	0.19	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 498.

Table 6.16 Dose-response estimates of impact on change in net real private transfers (birr) of average Direct Support transfers

Average Direct Support transfers	Predicted impact	Standard error	T statistic	Statistical significance
500	-8	13	-0.60	
1,500	86	45	1.91	*
2,500	158	91	1.72	*

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 498.

Table 6.17 Dose-response estimates of impact on probability that household starts nonfarm own business of years receiving Direct Support transfers

Number of years household received DS payments	Predicted impact	Standard error	T statistic	Statistical significance
1	0.175	0.038	4.62	***
2	0.164	0.022	7.59	***
3	0.120	0.036	3.35	***

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 490.

Table 6.18 Dose-response estimates of impact on probability that household starts nonfarm own business of average Direct Support transfers

Average Direct Support transfers	Predicted impact	Standard error	T statistic	Statistical significance
500	0.141	0.021	6.58	***
1,500	0.186	0.078	2.38	***
2,500	0.138	0.156	0.89	

Source: Calculated from household survey.
Notes: * significant at the 10 percent level; ** significant at the 5 percent level; *** significant at the 1 percent level. Sample size is 490.

Testing for differences across different "doses" of Direct Support, we find no evidence that Direct Support leads to a reduction in real private transfers.[13] In fact, the difference in the change in private transfer levels between beneficiaries receiving 500 and 2,500 average Direct Support payments is positive, 165 birr, and this difference is statistically significant. This is suggestive that Direct Support is crowding-in, not crowding out private transfers. Looking at Tables 6.17 and 6.18, we find no evidence that Direct Support increases, or decreases, the likelihood that a beneficiary household starts a new nonfarm own business.

[13] We account for inflation by deflating the 2010 transfer levels by the CPI.

6.5 Summary

In this chapter, we assess the effect of Direct Support payments on food security, asset creation, private transfers, and the likelihood that beneficiaries start nonfarm businesses. We find the following:

- Direct Support improves food security as measured by the number of months that the household reports that it can meet its food needs. In the few cases where average Direct Support transfers have been large, this effect is substantial. Increasing average Direct Support payments from 500 to 2,500 birr leads to a two-month improvement in food security.
- Across the outcomes considered here, there is no evidence that Direct Support has disincentive effects. Higher levels of Direct Support have led to more rapid asset accumulation. There is no evidence that Direct Support reduces ("crowds out) private transfers and there is some evidence that private transfers are crowded in.

Chapter 7: The Impact of Payments for Public Works in High Value Food Basket *Woredas*: 2008–2010

7.1 Introduction

We also have data on areas receiving a High Value Food Basket (HVFB) in selected *woredas* in Amhara. In this section, we use these data to examine the performance of the public works program in these HVFB *woredas*. The chapter begins by describing the payments data available to us. We estimate the impact of the PSNP in the HVFB *woredas* using the dose-response function, as described in Chapter 2. We apply the dose-response methodology across the following domains: food security, assets, and unintended consequences on private transfers and nonfarm own business activities.

7.2 Public Works payment data

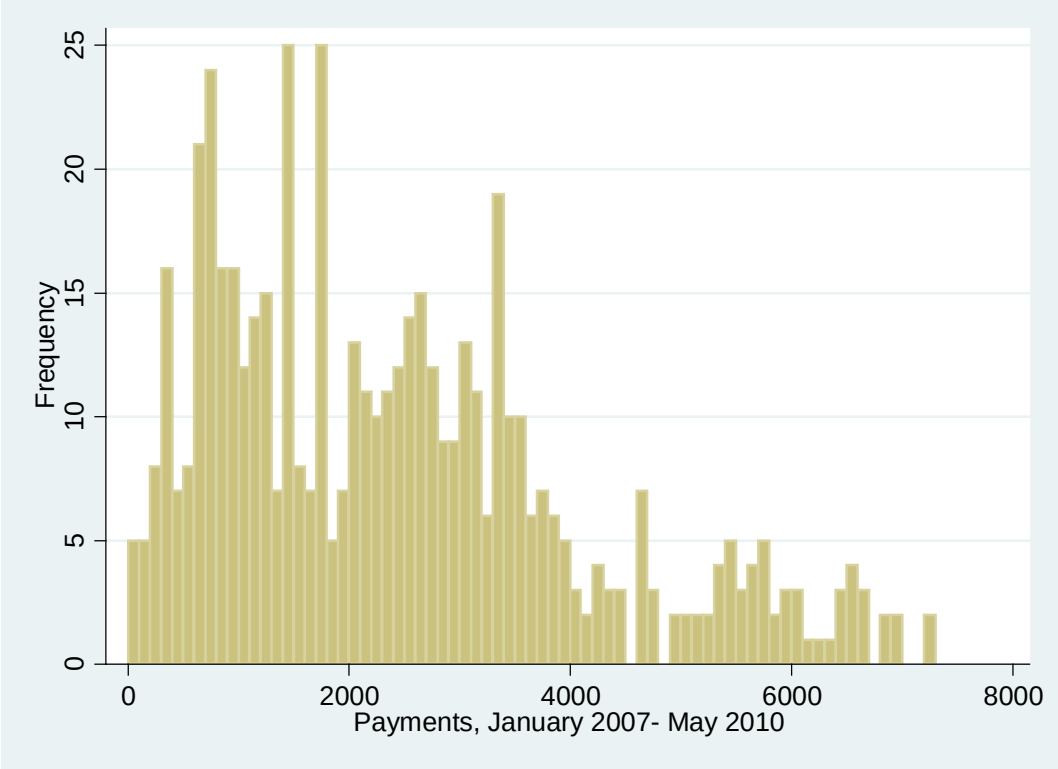
The 2008 and 2010 surveys give us payment data (both cash and in-kind) for the following periods: January 2007–May 2008 and January 2009–May 2010. We have data on community prices for foodgrains for a period of 12 months prior to each survey, which we use to value in-kind transfers. These values are added to cash payments received to generate the amount of total payments received over this period. Table 7.1 shows how many different years beneficiaries received PW payments conditional on receiving any PW payments.

Table 7.1 Number of years households received PW payments

Number of years household received PW payments	Frequency	Percentage
1	32	5.54
2	163	28.2
3	54	9.34
4	329	56.92
Total	578	100.00

Table 7.1 tells us that 578 households received payments for public works in at least one year between 2007 and 2010. More than half of these households received payments in all four years. Figure 7.1 shows the distribution of these payments, in 100-birr increments for households that received up to 7,500 birr. We exclude households receiving more than 7,500 birr; in most cases these are households with implausibly high levels of food transfers that may have resulted from misreporting of the quantities of food or the units in which these were reported. Although there are a wide range of values, the distribution is skewed to the left side of the distribution. Median transfers were 2,149 birr per beneficiary household. Relatively few—21 percent—receive more than 3,500 birr.

Figure 7.1 Distribution of PW payments: January 2007–May 2010



One feature of the HVFB *woredas* data has implications for the impact assessment and therefore needs to be highlighted. Since the earliest survey round available for these *woredas* is the 2008 round, we do not observe any outcome variables before 2008. As a result, when estimating the impact from 2008 to 2010, we are estimating the impact over and above what may have resulted from receiving up to three years of transfers from the program. Since the outcome variables are available 2008 onward, we cannot use payments data before 2008. Therefore we restrict our analysis to households that received positive transfers between January 2008 and May 2010, and examine impact on change in certain outcome variables over the same period. We present how many different years beneficiaries received PW payments conditional on receiving any payments during the period between January 2008 and May 2010. This is shown in Table 7.2.

Table 7.2 Number of years households received PW payments

Number of years household received PW payments	Frequency	Percentage
1	88	15.86
2	113	20.36
3	354	63.78
Total	555	100.00

Table 7.2 shows that 555 households received any PW payments in at least one year between 2008 and 2010. This is essentially a subset of households presented in Table 7.1,

which means all of these households also received payments in 2007. Figure 7.2 shows the distribution of these payments and we again find that the distribution is skewed to the left. The median transfers are 1,430 birr.

Figure 7.2 Distribution of PW payments: January 2008–May 2010

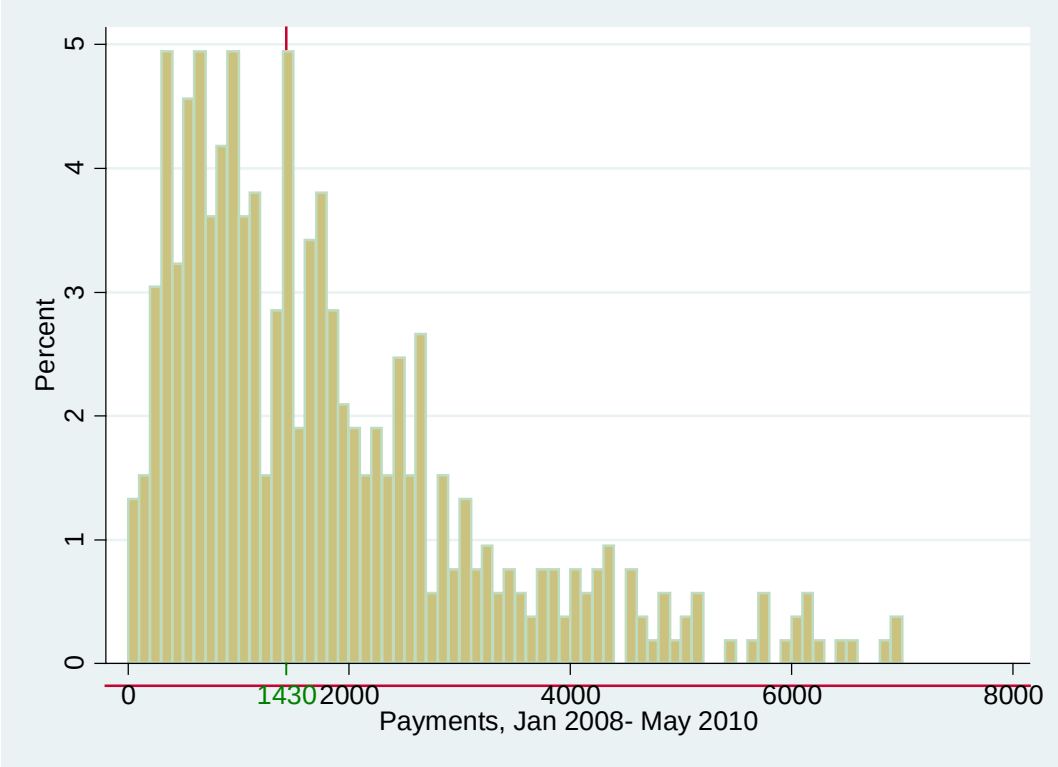


Table7.3 combines the information found in Table 7.2 with that found in Figure 7.2. The rows refer to the number of years that a household received PW payments. The columns show the level of payments at different points in the distribution of payments for households receiving payments for one year only, for two years, and so on. For example, the number 572 in the column marked "Median" means that for households that received payments in only one year, median payments were 572 birr. The number 2,537 in the column marked "75th" means that for households that received payments in only two years, the payment level at the 75th percentile (i.e., 75 percent of these households received less than this amount and 25 percent received more) was 2,537 birr.

Table 7.3 Distribution of payments (birr), by number of years households receive PW payments

Number of years household received PW payments	1st	10th	25th	Median	75th	90th	95th
1	17	242	361	572	993	1,497	3,014
2	92	220	503	943	2,537	3,773	5,717
3	328	695	1,083	1,766	2,643	4,237	6,595
Total	92	376	741	1,430	2,448	3,858	6,205

Table 7.3 tells us that at any point in the distribution of payments, households that receive more years of public works payments receive higher levels of total payments. Table 7.4 takes the data in Table 7.3 and divides it by the number of years that the household received payments. This allows us to compare the distribution of average payments across differing number of years of payments. This shows an oddity in the payment levels and numbers of years payments were received. We find that, barring those in the very low end (1^{st}) and those in the very high end (99^{th}) of the distribution of payments received, households that received payments in one year or those that received payments in three years received almost identical amounts of average payments across the distribution. Therefore the number of years that payments were received is not a good measure of exposure to the PSNP in the case of the HVFB *woredas*. Instead, we use the total amount of transfers received as the measure of exposure to the program in these *woredas*.

Table 7.4 Distribution of average payments (birr) per year by number of years households receive PW payments

Number of years household received PW payments	1^{st}	10^{th}	25^{th}	Median	75^{th}	90^{th}	95^{th}
1	17	242	361	572	993	1,497	3,014
2	46	110	252	472	1,269	1,887	2,858
3	109	232	361	589	881	1,412	2,198
Total	47	213	344	579	962	1,514	2,542

7.3 Impact of level of Public Works transfers on food security

Table 7.5 shows dose-response estimates for different levels of Public Works transfers on changes in the number of months that the households reports that it can meet its food needs between 2008 and 2010. Figure 7.3 graphs this dose-response function.

Table 7.5 Dose-response estimates of impact on months of food security of level of PW payments received

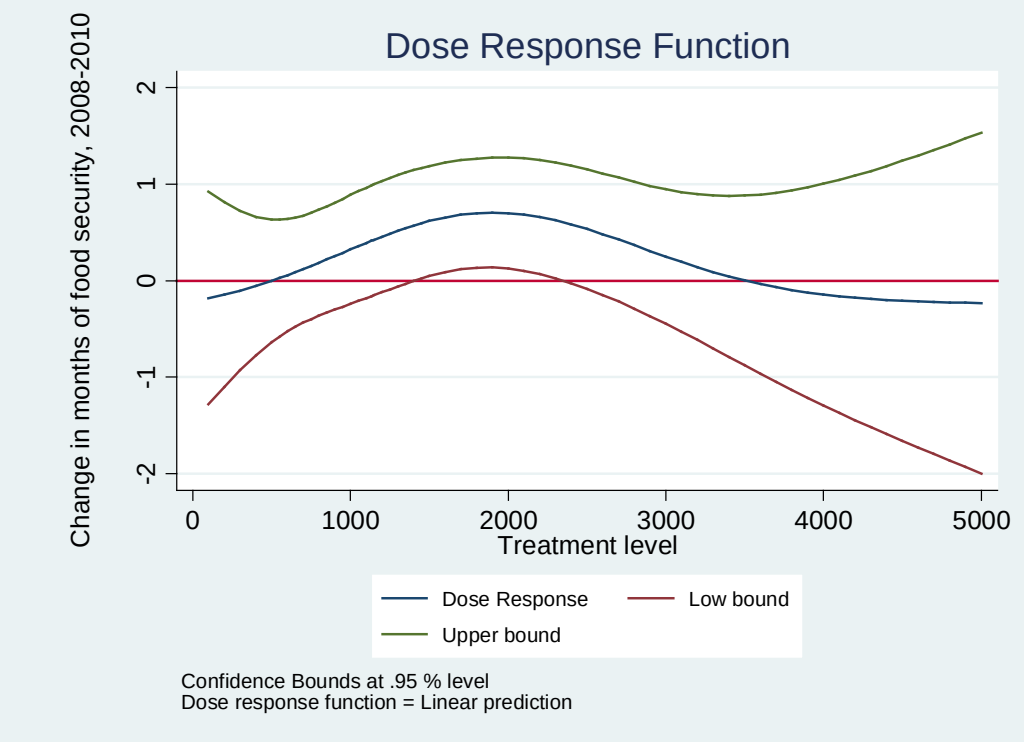
Level of PW payments	Predicted impact	Standard error	T statistic	Statistical significance
100	-0.179	0.562	-0.32	
600	0.057	0.296	0.19	
1,050	0.358	0.290	1.24	
1,500	0.617	0.291	2.12	**
1,900	0.705	0.290	2.43	**
2,500	0.534	0.316	1.69	*
2,900	0.308	0.344	0.90	
Difference between receiving 1,900 birr and 100 birr	0.884		19.06	***

Source: Calculated from household survey.
Notes: * significant at 10 percent level, ** significant at 5 percent level; *** significant at 1 percent level. Sample size is 186.

Table 7.5 and Figure 7.3 show that impact estimates are larger as the level of payments increase up to 1,900 birr—after which the point estimates start to decline but are not

estimated with precision. A Public Works household that receives 1,050 birr has an improvement of 0.38 months of food security. A household getting 1,500 birr and 1,900 birr of transfers has an improvement of 0.62 and 0.7 months of food security, respectively. Similar to the arguments followed in the rest of the report, we can consider a payment of 100 birr or less over two years as receiving almost nothing. But because these households were Public Works beneficiaries, they provide an excellent counterfactual for those who received higher levels of payments. The double difference impact estimate for, say receiving 1,900 birr as compared to 100 birr, is the difference between the impact estimates at these two levels of payments. This equals 0.88 months. We construct the t-test statistic for this difference, which has a value of 19.06. This tells us that the impact of receiving 1,900 birr compared to receiving virtually nothing is to increase household food security by 0.88 months.

Figure 7.3 Dose-response function for Public Works transfers and changes in the number of month of food security, 2008–2010



An important goal of the PSNP is to improve caloric availability at the household level. As mentioned in previous chapters, despite numerous attempts we have not been able to find evidence of improvement in this outcome. Several reasons for this have been mentioned in Chapter 4, one of which is the fact that this outcome is highly sensitive to receipt of payments in the months leading up to the survey. As discussed in Berhane et al. (2011), there were widespread payment delays in 2010. The second reason could be measurement error resulting from recall errors on part of the respondents. One way to address this is to examine the impact on the number of different foods that a household reports consuming in the last seven days.

Table 7.6 reports dose-response estimates for the change in diet diversity between 2008 and 2010. We find that at low levels of transfers, there is a decline in the diet diversity between 2008 and 2010, although this is statistically significant only at the 10-percent level (that, too, at very low levels of transfers). At higher transfer levels, we find that there is an increase in diet diversity but it is not very precisely estimated. However, when we estimate the double difference estimate between households that received 100 birr and those that received 1,900 birr, we find that having higher transfers leads to a statistically significant increase in diet diversity of about one food group over the two-year period under consideration.

Table 7.6 Dose-response estimates of impact on change in diet diversity of level of PW payments received

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
100	-0.707	0.369	-1.92	*
600	-0.043	0.205	-0.21	
1,050	0.360	0.226	1.59	
1,500	0.492	0.267	1.84	*
1,900	0.433	0.289	1.50	
2,500	0.282	0.261	1.08	
2,900	0.269	0.297	0.91	
Difference between receiving 1,900 birr and 100 birr	1.140		2.43	***

Source: Calculated from household survey.
Notes: * significant at 10 percent level, ** significant at 5 percent level; *** significant at 1 percent level. Sample size is 301.

The EFSS contained a range of questions on access to food—expressed in terms of number of meals consumed daily—in both the lean and non-lean seasons. These were asked separately for children and adults. Table 7.7 shows the dose-response estimates for the change in the number of meals children consumed in the lean season between 2008 and 2010. We find no impact on the number of meals consumed in the lean season by children.

Table 7.7 Dose-response estimates of impact on change in number of lean season child meals of level of PW payments received

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
100	0.047	0.215	0.22	
600	0.120	0.107	1.12	
1,050	0.020	0.116	0.17	
1,500	-0.169	0.156	-1.08	
1,900	-0.297	0.178	-1.66	*
2,500	-0.261	0.170	-1.53	
2,900	-0.101	0.167	-0.60	

Source: Calculated from household survey.
Notes: * significant at 10 percent level, ** significant at 5 percent level; *** significant at 1 percent level. Sample size is 169.

In our sample, the meal frequency declines in the lean season compared to the non-lean season. We can think of this feature in terms of a ratio: lean season meal frequency divided by non-lean season meal frequency. An increase in this ration between 2008 and 2010 means that

there is a smaller decline across seasons—in other words, less use of an undesirable food-coping strategy relative to what households do when food is more plentiful. We calculate impact estimates for this ratio for both children (Table 7.8) and adults (Table 7.9).

Table 7.8 Dose-response estimates of impact on change in lean season/non-lean season child meals of level of PW payments received

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
100	0.054	0.062	0.87	
600	0.015	0.030	0.50	
1,050	-0.035	0.034	-1.04	
1,500	-0.075	0.038	-1.97	**
1,900	-0.085	0.041	-2.08	**
2,500	-0.045	0.047	-0.96	
2,900	0.001	0.051	0.02	

Source: Calculated from household survey.
Notes: * significant at 10 percent level, ** significant at 5 percent level; *** significant at 1 percent level. Sample size is 164.

Among children we find a slight decline in the ratio at certain transfer levels indicating that the number of meals in the lean season compared unfavorably to those in the non-lean season (Table 7.8). Given that we find no impact on lean season meals, it may be driven by an increase in number of meals consumed in the non-lean season. We find no impact on this ratio for adults (Table 7.9).

Table 7.9 Dose-response estimates of impact on change in lean season/non-lean season adult meals of level of PW payments received

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
100	0.032	0.055	0.57	
600	-0.025	0.027	-0.93	
1,050	-0.050	0.025	-2.01	**
1,500	-0.043	0.032	-1.35	
1,900	-0.017	0.045	-0.38	
2,500	0.025	0.048	0.51	
2,900	0.039	0.043	0.93	

Source: Calculated from household survey.
Notes: * significant at 10 percent level, ** significant at 5 percent level; *** significant at 1 percent level. Sample size is 180.

7.4 Impact of level of Public Works transfers on assets

Apart from the overarching goal of improving food security among its beneficiaries, the PSNP also seeks to stabilize and then increase asset holdings. We examine the impact of level of Public Works payments on livestock holdings, expressed in tropical livestock units (TLU), and on the value of productive assets (tools).

Table 7.10 shows the dose-response estimates of impact on changes in livestock (TLU) of level of Public Works transfers received. The results show that at very low levels of transfers,

the impact on livestock is small and insignificant. But as the level of transfers received goes up, beneficiary households are able to accumulate between 0.38–0.51 TLU over the 2008–2010 period. The presence of such a dose effect is quite intuitive. These are households that are by selection among the most food-insecure. Therefore, at lower levels of payments, they are mostly taking care of their food security without drawing down assets and not accumulating any assets. But as the level of transfers increases, they are able to build their stock of assets.

Table 7.10 Dose-response estimates of impact on change in livestock (TLU) of level of PW payments received

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
100	0.058	0.447	0.13	
600	0.065	0.161	0.41	
1,050	0.196	0.175	1.12	
1,500	0.384	0.219	1.75	*
1,900	0.509	0.216	2.36	**
2,500	0.511	0.236	2.17	**
2,900	0.407	0.274	1.48	
Difference between receiving 1,900 birr and 100 birr	0.451		15.4	***

Source: Calculated from household survey.
Notes: * significant at 10 percent level, ** significant at 5 percent level; *** significant at 1 percent level. Sample size is 289.

Table 7.11 looks at the impact on changes in the value of productive assets. Here we find no evidence of any impact of Public Works transfers. Productive assets are essentially agricultural equipment. Lack of evidence on increasing the stock of such productive equipment may be due to shifting out of agriculture toward other nonfarm activities.

Table 7.11 Dose-response estimates of impact on change in value of productive assets (birr) of level of PW payments received

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
100	0.118	0.226	0.52	
600	-0.009	0.109	-0.08	
1,050	-0.066	0.115	-0.58	
1,500	-0.059	0.109	-0.54	
1,900	-0.021	0.093	-0.23	
2,500	0.026	0.114	0.22	
2,900	0.024	0.171	0.14	

Source: Calculated from household survey.
Notes: * significant at 10 percent level, ** significant at 5 percent level; *** significant at 1 percent level. Sample size is 288.

7.5 Impact of level of Public Works transfers on transfers and nonfarm own business activities

As mentioned in Chapter 4, a persistent concern with social safety net interventions is that they crowd out informal social safety nets, such as private transfers. Further, they can provide households with a disincentive to engage in new income-generating activities such as starting nonfarm own businesses. We address these concerns here.

Table 7.12 examines the impact of the level of Public Works transfers on changes in net private transfers received between 2008 and 2010. We define net private transfers received as the difference between transfers received and those given out in the previous 12 months. Both cash and the value of in-kind transfers are included in this measure. We find no evidence of crowding out of private transfers; in fact, there is a small—but not always statistically—significant increase.

Table 7.12 Dose-response estimates of impact on change in net transfers received (birr) of level of PW payments received

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
100	129.90	76.26	1.70	*
600	94.45	39.78	2.37	**
1,050	54.57	36.22	1.51	
1,500	19.72	42.32	0.47	
1,900	3.29	41.58	0.08	
2,500	8.13	36.17	0.22	
2,900	21.96	38.85	0.57	

Source: Calculated from household survey.
Notes: * significant at 10 percent level, ** significant at 5 percent level; *** significant at 1 percent level. Sample size is 303.

Table 7.13 examines the impact of level of Public Works transfers on the probability that a household starts a nonfarm own business. We find no evidence that higher transfers prevent households from starting a nonfarm own business. In fact, we find that receipt of transfers increases this probability by 5–7 percentage points.

Table 7.13 Dose-response estimates of impact on probability that household starts nonfarm own business of level of PW payments received

Number of years household received PW payments	Predicted impact	Standard error	T statistic	Statistical significance
100	0.090	0.064	1.40	
600	0.058	0.019	3.13	***
1,050	0.054	0.015	3.63	***
1,500	0.065	0.023	2.80	***
1,900	0.077	0.035	2.18	**
2,500	0.072	0.036	2.01	**
2,900	0.054	0.028	1.93	**

Source: Calculated from household survey.
Notes: * significant at 10 percent level, ** significant at 5 percent level; *** significant at 1 percent level. Sample size is 301.

7.6 Summary of results

This chapter has considered the impact of the level of Public Works transfers on food security in the HVFB *woredas* of the PSNP. We examined impact on food security, assets, and private transfers as well as the probability of entering nonfarm own business activities. We find that average payments received by households that received payments in one year are very similar to average payments received by those who have received payments for three years. This led

us to examine the dose-response model in terms of the amount of transfers received as opposed to the numbers of years transfers were received (as is the case in the rest of the report). The following provides a summary of the results found in this chapter:

- The PSNP has improved food security among households receiving the HVFB by 0.88 months. This impact is statistically significant.
- There is a statistically significant increase of about one food group over the two-year period between 2008 and 2010.
- There is no impact on changing the number of meals served to children in lean seasons.
- Among children, a slight decline in the ratio of meals served in lean season to meals served in non-lean season is observed. However, there is no impact on number of meals served to children in the lean season. This impact is solely driven by an increase in number of meals served in the non-lean season.
- At low levels of transfers (100-600 birr), there is no impact on accumulation of livestock. However, as transfer levels increase, we find a statistically significant impact of increase of about 0.38-0.51 TLU between 2008 and 2010.
- There is no impact on change in productive equipment.
- There is no evidence that the PSNP crowds out private transfers nor does it reduce the likelihood that participants start nonfarm businesses. In fact, results show that receipt of Public Works transfers increases the probability that a household enters nonfarm business activity.

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