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The Productive Safety Net Programme in Ethiopia

Impacts on children's schooling, labour and nutritional status

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The Productive Safety Net Programme in Ethiopia: impacts on children's schooling, labour and nutritional status

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Summary

Ethiopia's Productive Safety Net Programme (PSNP) is a large-scale social protection intervention aimed at improving food security and stabilizing asset levels. The PSNP contains a mix of public works employment and unconditional transfers. It is a well-targeted program; however, it took several years before payment levels reached intended amounts.

As noted elsewhere (Gilligan *et al.* 2009; Berhane *et al.* 2015), the PSNP has been successful in improving household food security. In this study, we assess whether it had additional impacts on children's schooling, labor and nutrition.

The descriptive analysis we undertook as part of this study, using quantitative data and qualitative fieldwork, shows that there are marked differences in the types of activities children undertake. We saw differences according to both sex and age, with labor demands increasing as children get older. While children in our focus groups make repeated reference to domestic and farm work, there are few references to paid employment outside the home. This is consistent with what we find in the quantitative data. In terms of the impact of the PSNP, there are suggestions of overall positive impacts, but these may differ by age.

The implementation of the PSNP restricted our choice of impact evaluation method. We use inverse probability weighting regression adjustment estimators. Although we found some impacts on schooling and child labor, these are not constant over time nor across child sex. In 2008, when PSNP payments were low relative to work requirements, participating in the PSNP lowered grade attainments for both boys and girls and increased child labor on family farms, although for boys, this was offset by reductions in domestic labor. As PSNP payments increased relative to PSNP work requirements – especially in 2012 – these adverse outcomes were reversed. In 2012, the PSNP increased girls' grade attainment between 6 and 14 percent (depending on the age of the child), improved schooling efficiency by 10 to 20 percent and reduced boys' labor.

We find no evidence that the PSNP reduces chronic or acute under nutrition. While we cannot definitively say why this occurs, we note that child diet quality is poor. We find no evidence that the PSNP improves child consumption of pulses, oils, fruit, vegetables, dairy or animal source proteins. Most mothers have not had contact with health extension workers, nor have they received information on good feeding practices. Safe water practices – as captured by the likelihood that mothers boil drinking water – are poor.

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List of figures and tables

Abbreviations and acronyms

CBN	community-based nutrition
CSA	Central Statistical Agency(Ethiopia)
DHS	Demographic and Health Survey
EA	enumeration areas
HABP	Household Asset Building Programme
HAZ	height-for-age Z-score
HVFB	high-value food basket
IFPRI	International Food Policy Research Institute
IPWRA	inverse probability weighted regression adjustment
IV	instrumental variable
NNM	nearest neighbor matching
OFSP	Other Food Security Programme
PSM	propensity score matching
PSNP	Productive Safety Net Programme
RDD	regression discontinuity design
SNNPR	Southern Nations and Nationalities Peoples' Region
WHZ	weight-for-height Z-score
WHO	World Health Organization

1. Introduction

This report analyzes the impact of Ethiopia's Productive Safety Net Programme (PSNP) on children's schooling, labor and nutrition. This chapter has two purposes: providing a road map to the report that follows and outlining the theories of change that underlie our study.

Chapters 2 and 3 provide introductory material. Chapter 2 describes the quantitative and qualitative data available to us. Chapter 3 explains the PSNP, its objectives and how it has been implemented. We pay particular attention to PSNP targeting and how the payment levels have evolved over time.

Chapters 4 and 5 provide our analysis of the impact of the PSNP on schooling and child labor. Chapter 4 summarizes the results of the qualitative fieldwork we undertook in two regions in October 2013. It introduces a number of important considerations, including regional differences in schooling, the importance of being aware of secular trends in these outcomes and differences by child sex and age. It also highlights that certain types of child labor – such as work on domestic tasks and family farm labor – are more important than others, such as off-farm paid employment. Chapter 5 provides our impact estimates. We begin with a general discussion of impact evaluation issues in the context of PSNP implementation, and go on to describe the impact estimator we use: inverse probability weighting regression adjustment (IPWRA). After explaining how we implement this estimator, we present our estimates of the PSNP's impact on schooling and child labor.

In Chapter 6, we turn our attention to the PSNP's impact on the nutritional status (height and weight) of preschool children. We begin by describing these data and showing trends over time in chronic and acute malnutrition, using height-for age Z-scores (HAZ) to measure childhood stunting and weight-for-height Z-scores (WHZ) to measure childhood wasting. After briefly describing how we implement the IPWRA estimator, we present our impact estimates. Strikingly, we find no evidence of impact. We explore some of the reasons for this, focusing on the lack of contact with health and nutrition services, low levels of consumption of foods that have not gone stale and poor water and sanitation practices.

1.1 Theory of change

In this section, we present our theories of change for the child schooling/labor and preschool nutrition outcomes. We also integrate our discussion of mixed-methods approaches into these discussions.

1.1.1 Child schooling/labor

Our theory of change for child schooling and labor outcomes is similar, but not identical, to the one we use for nutrition outcomes. We conceptualize parental decisions to devote resources to improving child schooling as motivated both by immediate concern about their welfare and by longer-run concerns about their well-being as represented by their future consumption or, as a proxy for this, their

education. In this way, a child's schooling outcomes appear as an argument in the welfare function of the households in which they reside; it is a reflection of both the intrinsic value placed on schooling and its instrumental value in increasing future consumption. Welfare is likely to increase as schooling improves, although possibly at a diminishing rate. As with the conceptualization of nutrition, parents may not agree on how to use the family resources and may engage in (perhaps implicit) bargaining about resource allocation, both total allocations to all children and how they distribute these among their children. Parents' decisions about devoting resources to their children's schooling are affected by the resource constraints – on income, time and prices – that their households face. Another constraint arises from the production process for schooling. This links schooling resources provided by the household (such as notebooks and fees) and the time both children and parents devote to producing schooling outcomes to locality characteristics such as school availability and quality.

Participation in the PSNP's public works component affects both income and time constraints, but in different ways. The income parents receive from undertaking this work relaxes the income constraint. If they use some of this income to improve the resources they devote to schooling, this should improve schooling outcomes. However, participating in public works creates a new demand on parents' time. If this increased work load reduces the time devoted to improving schooling outcomes – for example, if it reduces the amount of time parents spend monitoring their children's study time at home – or if households increase the amount of time children spend on tasks and chores in the home or working on the family farm, then participating in the program may harm schooling outcomes.

As with our analysis of nutrition outcomes, our impact analysis will provide an aggregate assessment of these pathways while allowing us to disentangle the income and time effects. By disaggregating the sample by sex, we can see if the impacts differ across boys and girls. Although there is little evidence that Ethiopian parents deliberately favor boys over girls in decisions about sending children to school, girls spend more time on domestic tasks. It will be of interest to see if a household's participation in the PSNP, and participation by adult females, affects girls' schooling outcomes. Disaggregating by sex of household head will show us whether the time burden imposed by PSNP participation has a bigger effect in female-headed households, where labor resources are more limited.

1.1.2 Preschool nutrition outcomes

We conceptualize parental decisions to devote resources to improving child nutrition as motivated by both immediate concern about the children's welfare and longer-run concerns about investing in their children's human capital. A child's nutritional status appears as an argument in the welfare function of the households in which they reside; it is a reflection of the intrinsic value placed on nutritional status. Welfare is likely to increase as nutritional status improves, although possibly at a diminishing rate: increases in certain measures of nutritional status – such as body mass – may be associated with reductions in welfare beyond a certain point. If parents disagree

on how they should use family resources, they will probably engage in (perhaps implicit) bargaining about how they allocate them. In such cases, the strength of each parent's bargaining position may depend on her/his access to resources, including those provided by social networks and policies.

The decisions that parents make, whether through bargaining or some other mechanism, about the resources they devote to their children's nutrition and health are constrained in several ways. Resource constraints reflect income, time available and the price of food and health services. Production process constraints link nutrient intakes – the physical consumption of macronutrients (calories and protein) and micronutrients (minerals and vitamins) – and the time devoted to the production of health and nutrition with locality characteristics such as the presence of preventative and curative health facilities, the prevalence of infectious diseases and an individual's genetic make-up, knowledge and skill regarding the combination of these inputs to produce nutritional status. We note that this characterization, which is derived from standard economics approaches to human capital formation, closely mirrors the framework the United Nations Children's Fund uses to conceptualize the determinants of children's nutritional outcomes. This mirroring is highly advantageous, as it will enable us to communicate our results in a language that will be familiar to a broad audience.

Participation in the PSNP's public works component affects both income and time constraints, but in different ways. Income received from undertaking this work relaxes the income constraint. If some of this income is used to improve the consumption of nutrients, this should improve preschool nutritional status. However, participation in public works creates a new demand on parents' time. If this increased work load reduces the time devoted to childcare – for example, if children are fed less frequently because their mothers are away from the household – then participating in the program can harm preschool nutritional status.

1.1.3 Cost-effectiveness analysis

The PSNP has multiple goals:

- strengthening local administrative capacities to operate social protection interventions
- creating community assets through public works
- transferring income to beneficiaries.

Given this multiplicity of goals, a simple cost-effectiveness analysis focusing only on the schooling and nutrition benefits would understate the benefits vis-à-vis the costs of the PSNP. Instead, our approach will assess the magnitude of the schooling and nutrition benefits as incremental to food security and physical asset improvements.

2. Data

2.1 Quantitative data

We draw on four rounds of data. Starting in 2006, we collaborated with the Government of Ethiopia's Food Security Coordination Directorate (who implement the PSNP) and Ethiopia's Central Statistical Agency (CSA) on the design and implementation of a longitudinal survey of PSNP beneficiaries and non-beneficiaries. Based on the list of *woredas*[1] initially included in the PSNP, this study randomly sampled 68 *woredas* proportional to size and stratified by region. Within each *woreda*, we randomly selected sample enumeration areas (EAs) from a list of EAs with PSNP activities. Within each EA, we constructed a list of households that included information on PSNP beneficiary status. From these lists, we randomly sampled 15 PSNP beneficiary and 10 non-beneficiary households in each EA. We based these sample sizes on power calculations showing how large the sample needed to be to identify an effect size equivalent to a 10 percentage-point increase in food security, assessing whether the PSNP was improving household food security was the original objective of the survey.

The survey rounds took place as follows: July and early August 2006; late May to early July 2008; June and July 2010; and June and July 2012. Interviews with sampled households collected information on household demographic composition, assets, agriculture, non-agricultural income-generating activities, consumption, food security and shocks. This longitudinal survey contains extensive information on households' PSNP participation, including: the months and years in which the household undertook public works; duration of participation; number of days worked by all household members (men and women); and payment received for this work. These data are accompanied by detailed information on targeting criteria and the correlates of program participation, including pre-program household and locality characteristics.

Each survey round collected education and child labor data. We drew education-related outcomes from schooling histories that include: ever attended school; age at first enrolment; attend school in last 12 months; withdrawn from school in last 12 months; current enrolment status; grade attainment; whether the child is withdrawn from school to assist with farming or other household activities; grade advancement; and speed of grade progression. Child labor data include whether children undertook domestic tasks, worked on the family farm or worked for pay outside the household; and the number of hours they spent on these activities in a typical week.

We collected anthropometric information in 2008, 2010 and 2012, but not 2006. We complemented this household-level data collection with a quantitative community survey that modulates on access to school and health facilities and a community price questionnaire.

[1] A *woreda* is an administrative unit equivalent to a district or county.

Table 1 shows the number of households interviewed by round and region. The 2006 survey generated data on 3,680 households in 148 EAs in 68 *woredas.* In 2008, the CSA enumerator assigned to each EA used the list of households interviewed in 2006 along with (in some cases) maps and assistance from local officials and residents to locate the households for reinterview. Attrition was low, with only 153 137 households (4.1 percent of the baseline sample) not reinterviewed. About a third of these were from two EAs in Oromiya, where the PSNP ceased operating.

The 2008 survey reinterviewed 3,551 households in 146 EAs within 68 *woredas*. The CSA also collected data from 1,163 households within 44 *kebeles*[2] in 11 *woredas* in the Amhara region, where the United States Agency for International Development had supported the PSNP through grants to eight non-governmental organizations. These are referred to as the Amhara-HVFB sample.[3] In total, the 2008 survey generated data on 4,690 households.

The 2010 survey traced and reinterviewed the households in the 2006–2008 panel and those in Amhara-HVFB, interviewing 4,645 households.

The government of Ethiopia requested that the 2012 survey be expanded to include households that had recently graduated from the PSNP as well as those receiving direct support payments,[4] using lists held at *kebele* level to ensure adequate representation of elderly and disabled households. As a result, the 2012 survey interviewed 5,092 households.

Table 1: Number of households interviewed by region

	Tigray	Amhara	Amhara-HVFB	Oromiya	SNNPR	Total
2006	897	894	-	939	950	3,680
2008	868	867	1,163	861	931	4,690
2010	846	847	1,150	885	917	4,645
2012	991	985	1,103	965	1,048	5,092

2.1.2 Attrition rates

Attrition in the sample is low, especially considering the physical inaccessibility of these localities and the fact that this is the CSA's first ever longitudinal survey. In the non-Amhara-HVFB localities, out of the 3,680 households interviewed in 2006, 3,197 were interviewed in 2012. Of the 483 households that attrited, 101 were lost because the *kebele* was not re-surveyed as the PSNP had ceased operating. The attrition rate across the four survey rounds is 13.1 percent or 2.1 percent per year. For the

[2] A *kebele* is an administrative sub-unit of a *woreda*. It is equivalent to a sub-district.
[3] HVFB refers to the high-value food basket that these households receive.
[4] Direct support payments are unconditional transfers given largely to elderly or disabled people's households. See Chapter 3 for further details.

Amhara-HVFB sample, in 2012, the CSA reinterviewed 91.8 percent of the 2008 sample (1,066 out of 1,163) yielding an annual attrition rate of 2.0 percent. These are comparable to attrition rates in large-scale household surveys in developed countries.

We examined whether household attrition is random or systematic. Table 2 provides an example of our approach. We estimate a probit where the dependent variable equals one if the household was interviewed in the 2012 survey round; zero otherwise. This is a function of baseline (2006) household characteristics and location (*woreda*) dummy variables.[5] In Table 2, we convert parameter estimates into marginal effects and standard errors to account for clustering at the sampling (*woreda*) level. These results exclude the households in Amhara-HVFB.

A large number of household characteristics are not correlated with attriting. There is no association with the household head's age or schooling. Wealth, as measured by land and livestock holdings, does not affect the likelihood of attrition, nor does program participation or measures of households' connectedness to the area – the household head being born in the locality and whether their parents ever held an official position in the locality.

Two characteristics do affect attrition. Female-headed households are two percentage points less likely to be traced and all the household size dummy variables are statistically significant. However, they are all measured relative to the omitted category, a one-person household. This tells us that one-person households are more likely to have attrited. But since one-person households contain no children, this is unlikely to be a source of bias in our work. Relative to households of other sizes, attrition was less likely in households of six, seven or eight, but the magnitude of this difference – on the order of 1 to 3 percent – is unlikely to be meaningful.

For selected education and child labor impacts, we looked at the 2006 sample to assess statistical power. Using a 95 percent confidence level and statistical power of 0.80, and taking into account that we have a fixed number of clusters and intra-cluster design effects, we calculated the required sample sizes as follows. In the 2006 round, we have 5,144 children aged 6 to 16 (2,664 boys and 2,480 girls) equally divided between households receiving public works payments under the PSNP and non-PSNP households. This suggests that we will have statistical power to detect these effect sizes for schooling and child labor even when disaggregating by sex. These calculations do not account for attrition, nor for the fact that, when using matching methods, controls can be matched to more than one treatment, effectively increasing our sample size.

[5] For brevity, we do not include the parameter estimates for the *woreda* dummy variables in Table 2.

Table 2: Determinants of likelihood that households were interviewed (2012)

Household characteristics	Mean (1)
Age of household head	0.000
	0.000
Sex of household head	-0.022**
	0.010
Household head highest grade completed	-0.000
	0.001
Household had two members	0.062***
	0.009
Household had three members	0.063***
	0.010
Household had four members	0.075***
	0.011
Household had five members	0.082***
	0.009
Household had six members	0.093***
	0.007
Household had seven members	0.086***
	0.006
Household had eight members	0.082***
	0.005
Household had nine members	0.073***
	0.005
Household had 10 members	0.067***
	0.007
Household had 11 members	0.069***
	0.004
Household had 12 members	0.056**
	0.026
Landholdings operated (hectare)	0.001
	0.007
Number of livestock owned	0.001
	0.001
Household has been a PSNP beneficiary	0.005
	0.008
Household head was born in this locality	0.012
	0.016
Parent of household head ever held an official position in this locality	-0.010
	0.021

Note: ** statistically significant at the 10 percent level; *** statistically significant at the 5 percent level.

2.2 Qualitative data

Our quantitative work gives us evidence on what impacts we observe, but provides only limited information on why we observe them. For this reason, we are complementing our quantitative work by collecting and analyzing qualitative data. Specifically, we seek adolescents' views on the impact of the PSNP on their schooling, the schooling of their peers and the time they have to spend on household and farm work. We are particularly interested in tensions between their educational and household responsibilities when their parents participate in public works. These data, along with key informant interviews with teachers and headmasters, will give us a richer picture of the potential benefits and unintended adverse effects of public works on children's welfare.

We completed the qualitative fieldwork in October 2013, in two regions where the PSNP currently operates: Tigray and Oromiya. We selected these regions partly because they have high PSNP coverage, allowing us to identify enough adolescents with parents who participate in public works. Tigray has the highest rate of women's participation in the PSNP's public works component. As such, it is the region where we might expect to find the greatest pressure on children to take on household work that was previously done by their parents, particularly their mothers. In Oromiya, children have historically played a particularly large role in farm activities, notably herding cattle. Children's schooling attainments are low here.

In each region, we conducted studies in two localities within a selected woreda: Atsbi-Wenberta in Tigray and Boset in Oromiya. The PSNP operates in both these *woredas* and we know, from analyzing secondary data, that there are established primary and lower secondary schools in both areas. We selected two *kebeles* in each woreda, including only rural schools in the sample, as the research aims to examine the pressures of child household and farm labor, as well as the PSNP, on schooling. IFPRI staff led interviews and focus groups, facilitated by local, trained translators who spoke Tigrinya, Oromiffa and Amharic. In each region, local language-speaking observers accompanied all focus group discussions and interviews, helping to take notes.

We conducted key informant interviews with school headmasters in each *kebele* where focus group discussions took place. These interviews took approximately 30–45 minutes and covered subjects such as school resources and infrastructure, enrolment patterns by age and sex, and reasons for absenteeism, late enrolment and dropping out.

Following discussions with *kebele* administration officials and/or schoolmasters, we purposively selected boys and girls from grades 5–8 (aged 12–16) representing different levels of attendance and performance for semi-structured focus group discussions. These took between 60 and 90 minutes. We recorded audio on two digital devices: the Olympus Digital Voice Recorder WS-110 and via the Dropbox application on an iPhone 4. IFPRI presented a formal letter to the *kebele* administration and schoolmasters to inform them of our research activities, collaborating partners and oral consent.

Although schoolmasters helped us select participants, our researchers helped with the purposive sampling of students to avoid the selection of only highly motivated or regularly attending students. In each locality, we organized two focus group discussions: one for boys and one with girls. Each group had 8–12 participants. Aged 12–16, participants were old enough to understand informed consent, to have sufficient experience of both school and domestic labor (in farm or household tasks) and to have informed opinions they are comfortable sharing with outsiders. We chose not to include children older than 17 because the vast majority have permanently dropped out of school and can offer only limited insights into the tensions between schooling and household work.

Because the focus group discussions involved children under the age of 18, they obtained consent from their parents as well as giving their own consent to participate. We did not record participants' names and cannot link any information obtained back to a participating individual. We gave participants the contact information of two IFPRI researchers (one based in Ethiopia and the principal investigator) who they could contact if they had any concerns.

Focus group participants were a mix of children whose parents do and do not participate in the PSNP public works component. We identified potential participants through discussions with headmasters, taking into account the children's age, maturity, health condition and psychological and emotional states as we developed a list of possible participants. Selected students included those with varying years of family participation in PSNP, non-participants and graduates of the PSNP. This technique ensured that each group included varying levels of attendance. However, we could not include school drop-outs in the sample, as it was difficult to identify them.

3. The Productive Safety Net Programme

3.1 Introduction

This chapter provides background information on the PSNP, drawing heavily on the extensive work we have done for the government of Ethiopia on the program's operations (Berhane *et al.* 2011, 2013; Gilligan *et al.* 2007, 2009). After providing an overview, we examine three aspects of program's implementation that are relevant to our impact analysis: targeting, payments and work. The chapter summary draws out some implications this has for our analytical work.

3.2 Program overview

Between 1993 and 2004, the government of Ethiopia launched near-annual emergency appeals for food aid and other forms of emergency assistance. While these succeeded in averting mass starvation, especially among the assetless, they neither banished the threat of further famine and nor prevented asset depletion among the marginally poor households affected by adverse rainfall shocks. Further, the ad hoc nature of these responses meant that the government did not integrate emergency assistance – often in the form of food-for-work programs – into ongoing economic development activities.

Starting in 2005, the government and a consortium of donors implemented a new response to chronic food insecurity in rural Ethiopia. Rather than annual appeals for assistance and ad hoc distributions, they established the Productive Safety Nets Programme (PSNP). It began at scale in the four regions covered by this study; there was no graduated scale-up or rollout.

The PSNP's objective was to provide transfers to the food-insecure population in chronically food-insecure *woredas* in a way that prevents asset depletion at the household level and creates assets at the community level (GFDRE 2004, 2009a). Unlike the annual emergency appeals, the PSNP was conceived as a multiyear program to provide recipients with predictable and reliable transfers. Most beneficiary households do public works: criteria for selection are that a household is poor (for example, it has low holdings of land and/or cattle) and food insecure, but also has able-bodied labor power. A much smaller proportion of beneficiaries receive direct support: these households are poorer than those receiving public works employment and lack labor power. Households whose primary income earners are elderly or disabled would qualify for direct support.

From 2005 to 2007, the public works component paid beneficiaries either 6 birr per day[6] (increased to 8 birr in 2008, 10 birr in 2010 and 14 birr in 2012) in cash or three kilograms of cereals (depending on where they lived) in exchange for working on labor-intensive projects building community assets. Most of these works take place between January and June so as not to interfere with farming activities in the second half of the year.

Initially, the PSNP was complemented by a series of food security activities, collectively referred to as the Other Food Security Programme (OFSP). While the PSNP is designed to protect existing assets and ensure a minimum level of food consumption, the OFSP was designed to encourage households to increase their income from agricultural activities and build up assets. The OFSP included: access to credit; assistance in obtaining livestock, small stock or bees, tools and seeds; and assistance with irrigation or water-harvesting schemes, soil conservation and improvements in pasture land. However, relatively few households could access the OFSP, so the government collaborated with donors to extensively redesign program, leading to the Household Asset Building Programme (HABP).

The HABP placed increased emphasis on contact and coordination with agricultural extension services while expanding access to credit through microfinance institutions and rural savings and credit cooperatives (GFDRE 2009b). Although it has limited capacity to assist non-agricultural enterprises, the HABP has improved the agricultural support provided by development agents. While many households reported contact with development agents, assistance remains concentrated on crop production. Access to new forms of credit has also been limited, with relatively few households borrowing money to buy inputs or livestock (Berhane *et al.* 2013).

[6] 1 Ethiopian birr = 0.05 USD.

3.3 Targeting

The PSNP uses a mix of geographic and community-based targeting to identify chronically food-insecure households in chronically food-insecure *woredas*. The program used historical data on food aid allocations to select 190 *woredas* and determine the number of eligible beneficiaries in each region and *woreda*. As a result, program coverage was higher in the historically famine-prone northern regions of Tigray and Amhara and lower in Oromiya and the Southern Nations and Nationalities Peoples' Region (SNNPR).

Household-level targeting initially focused on selecting households with high levels of food insecurity that had been recipients of emergency food aid. Having made the initial selection based on this basic criteria, the PSNP then used household assets – such as landholdings, oxen and income from non-agricultural activities and alternative sources of employment – to verify and refine the selection of eligible households. Communities have substantial discretion to modify this selection approach and update their lists of food-insecure households annually based on local criteria. So local authorities can add, for example, households that suddenly become more food insecure as a result of a severe loss of assets and are unable to support themselves, or households without family support and other means of social protection and support to the beneficiary lists.

After determining PSNP eligibility based on these criteria, households are assigned to public works or direct support, depending on whether they have able-bodied adults. Most beneficiary households participate in public works; a much smaller proportion receives direct support.

Analysis of the PSNP's targeting indicates that it performs well. Coll-Black *et al.* (2012) demonstrate that the PSNP is targeted toward households that are both food-insecure and poor, in terms of total household resources. Although there are some variations, most regions do follow the overall program guidelines when targeting households. Public works projects target the poor, rather than food-insecure households, but as poverty is highly correlated with food insecurity, these poor households are invariably also food insecure. Rather than targeting households based on poverty, the direct support element targets those with limited labor endowments.

Community understanding of targeting criteria has improved across most of the PSNP regions. Most have got better at identifying poverty-related factors as reasons to select households for public works in most regions; and most understand that elderly and disabled people are the intended recipients of direct support. Family or friendship connections were not reported as major factors in a household's likelihood to receive public works or direct support.

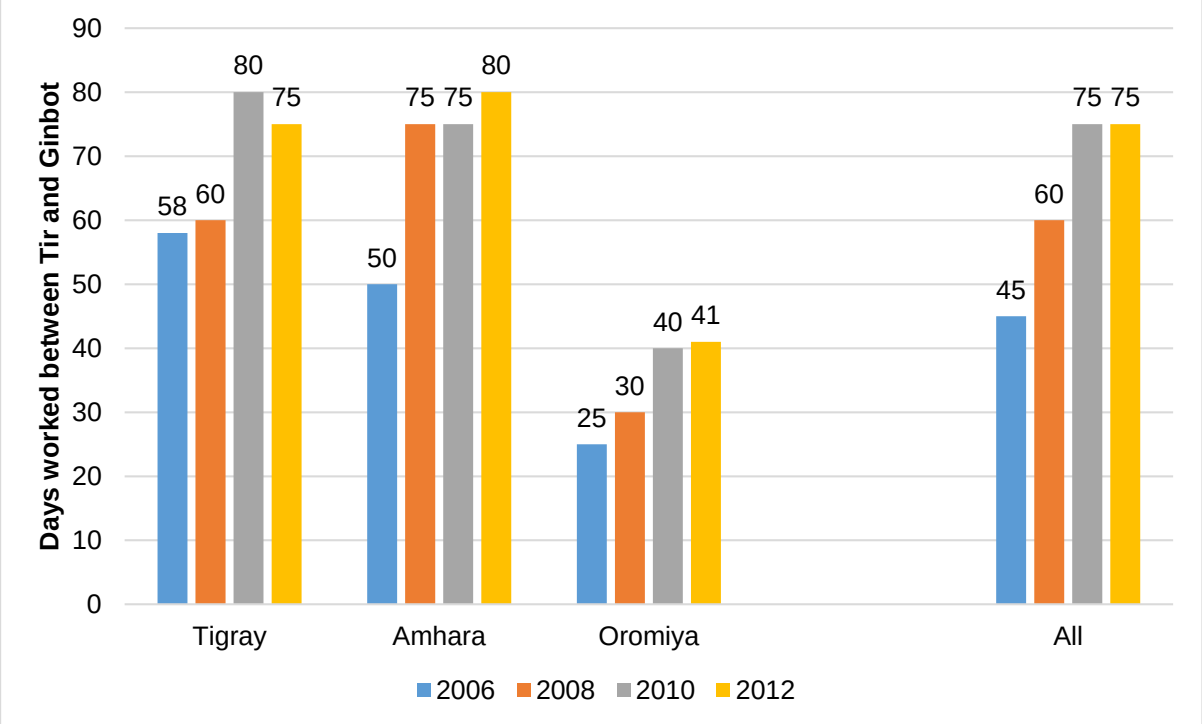
3.4 Public works employment

Figure 1 displays the median number of days worked, per household, by region and year, conditional on having worked at least one day in that year. It is important to

note that, because of the timing of the surveys, the data pertain to the first five months of each year: Tir, Yekatit, Megabit, Miaza, and Ginbot in the Ethiopian calendar (approximately January to early June). This period corresponds to the final five months of the Ethiopian school year.

Figure 1 indicates some regional and temporal variations in days worked over this period. Employment is lowest when the program begins in 2006, rising in 2008 and 2010. By 2010, the median beneficiary household was receiving 75 days' employment through the PSNP, a level maintained in 2012. In all years, employment in this period is higher in Tigray and Amhara than in Oromiya. After 2006, respondents were also asked about employment during the previous year (so in the 2008 survey, respondents were asked about work in 2007; in 2010, they were asked about 2009, and so on). This allows us to assess whether, for example, employment levels in Oromiya are low or if employment occurs in another time period in the calendar year. Analysis of these data showed that in Tigray and Amhara, 75–80 percent of PSNP employment was completed between Tir and Ginbot. In Oromiya, 40 percent of employment took place in the second half of the year.

Figure 1: Median number of days worked per public works beneficiary household, by region (Tir – Ginbot)



Source: Authors' calculations.

In preliminary work, we examined the distribution of employment by sex over the five-month period. In Tigray, employment is fairly evenly split between men and women, while in Amhara, around 40 percent of public works are undertaken by women. Women's participation in public works is lowest in Oromiya, where only about 30 percent of women worked.

We also examined the age distribution of public works participants. In particular, we wondered if children were employed in public works activities. This does not appear to be the case. The quantitative data show that there are only 10 children in the more than 2,500 individuals who undertook public works employment in the first five months of 2010.[7] Individuals aged 20–29, 30–39 and 40–49 make up nearly 70 percent of the workforce engaged in public works.

3.5 Payments

During the program's first five years, there were difficulties in making timely and predictable payments to beneficiaries. But program performance has significantly improved since 2010. A full discussion of this can be found in Berhane *et al.* (2011 and 2013) and Gilligan *et al.* (2007 and 2009).

Enumerators collected data on payments in all the survey rounds. Respondents who indicated that they were PSNP participants were asked to recall, month by month, the payments they had received. Enumerators valued any payments in kind (mostly grains, but also pulses and oils) using local market prices obtained from a market survey fielded alongside the household survey. Relying on respondent memories of past payments raises the issue of measurement error in these data. This problem was partially resolved by the 2012 survey, as the PSNP was rolling out client cards that record household payments. Enumerators would ask to see respondents' client cards and copy the information from those onto the questionnaire. If the households stated that they did not have a client card or were unable or unwilling to show it, enumerators would then ask respondents to recall their payment information.

Using these data, we reproduced a table modeled on a table from Berhane *et al.* (2013). Table 3 compares the level and distribution of public works payments data from client cards and recalled information for 2011. For public works, the mean payments recorded on client cards were 2,387 birr; mean payments as recollected by respondents were 2,342 birr. This is a difference of only 45 birr or 1.9 percent. Both sources of information provide remarkably similar distributions of payments and means when we disaggregate by recall period. For direct support payments, the difference in mean values is only 10 birr or 0.9 percent.[8] This gives us further confidence that our payments data provide a reasonable representation of payments received by beneficiaries.

[7] We were concerned that, if parents understate the age of their children, these data would understate the extent of child labor. If this were true, we might expect to see age heaping around the cut-off age of 15. But examination of the sample's age distribution shows only a slightly higher percentage of 15-year-olds compared to 14 or 16-year-olds.

[8] Full results are available on request.

Table 3: Comparison of public works payment data from client cards and respondent recall, by time period and type of transfer (2011)

			Percentiles				
Source	**Mean**	**Sample size**	**p10**	**p25**	**p50**	**p75**	**p90**
Tir – Tahisis (January–December)							
Recall	2,342	878	790	1,225	1,956	2,940	4,250
Client card	2,387	537	840	1,260	1,845	3,000	4,200
All	2,359	1,415	825	1,260	1,917	2,977	4,200
Tir – Sene (January–June)							
Recall	1,852	868	600	975	1,500	2,400	3,364
Client card	1,816	533	600	981	1,500	2,160	3,350
All	1,838	1,401	600	981	1,500	2,300	3,353
Hamle – Tahisis (July–December)							
Recall	1,045	429	250	444	825	1,363	1,960
Client card	1,078	291	240	560	900	1,350	1,800
All	1,059	720	245	471	883	1,350	1,825

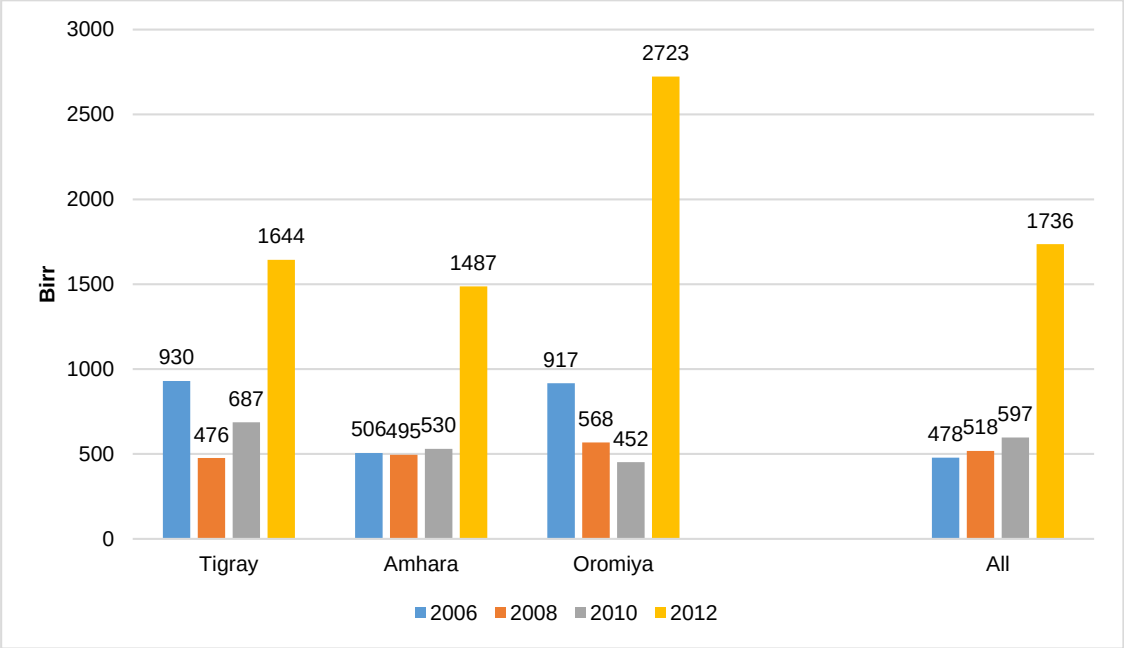
Source: Household questionnaire 2012.

Figure 2 shows median payments to PSNP public works participants by survey round. Because there is significant food price inflation, we constructed a price index using the information on grain prices we collected as part of the quantitative community questionnaire. We use this to deflate all payment values to 2014 birr. This shows that in real terms, payments to beneficiary households were largely flat between 2006 and 2008, even though the number of days worked was rising (Figure 1). Payments rise slightly between 2008 and 2010 (by 80 birr), but there is a steep increase in 2012.

Why do we observe this pattern? In the program's early years, there were significant delays in making payments. For example, Gilligan *et al.* (2009) show that in the first five months of 2007, just over 80 percent public works participants in SNNPR received at least 80 percent of the money owed to them. In Oromiya, Amhara and Tigray they received 63, 62 and 18 percent, respectively. Most of these arrears remain unpaid. Other problems included difficulties in processing payment information, ensuring timely receipt of food for in-kind payments and limited access to the transport needed to pay PSNP beneficiaries.[9]

[9] We have limited information on why some localities received cash payments while others received food. Although regions and *woredas* could request cash, food or a mixture of both, the form of payment often depended on the physical availability of commodities in government storage facilities, which varied over time and space. Demands for in-kind transfer increased when food prices rose in 2008, but, we understand, subsided thereafter. The timing, frequency and amount of in-kind transfers also differed from cash payments. Since we cannot model the determinants of the receipt of cash or in-kind payments, and because they are not directly comparable, we do not attempt to disaggregate our results by form of payment.

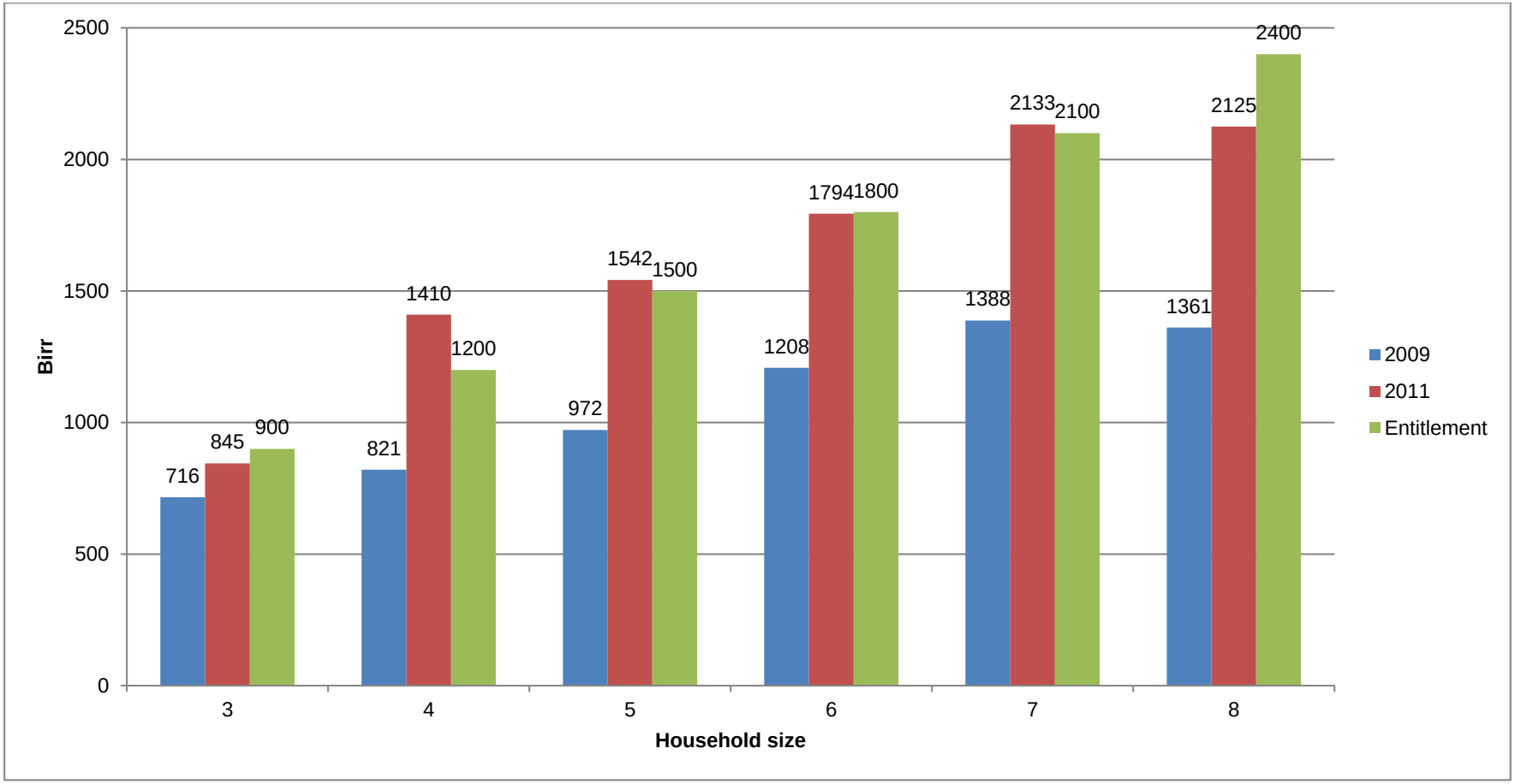
Figure 2: Median total payments to public works beneficiary households, by region



Source: Authors' calculations.

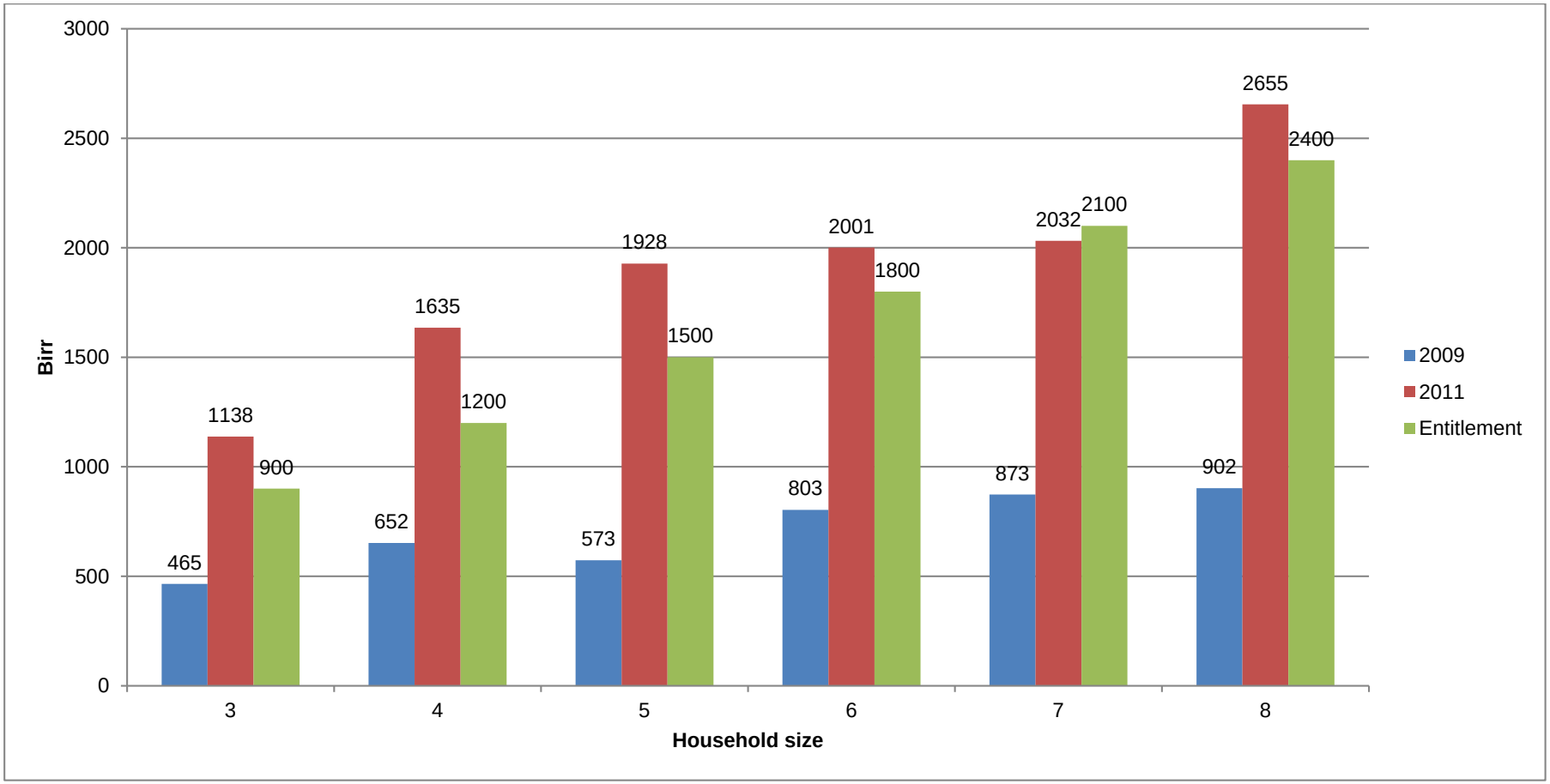
In response to these problems, the government revised the payment system, introducing full family targeting, whereby each household member is entitled to five work days per month for six months. For example, at a wage rate of 10 birr per day, this yields a payment of 300 birr per household member. This means that a three-person household should receive 900 birr, a four-person household should receive 1,200 birr, and so on. In our operational work for the Ethiopian government, we compare these expected levels of payment against mean total payments by region for households ranging in size from three to eight persons. Figures 3 and 4 show considerable variations in payments by region and year in Tigray and Oromiya, as well as considerable improvements in payments between 2010 and 2012.

Figure 3: Comparison of normalized total payment to full family targeting entitlement in Tigray, by household size (2009 and 2011)



Source: Berhane et al. (2013).

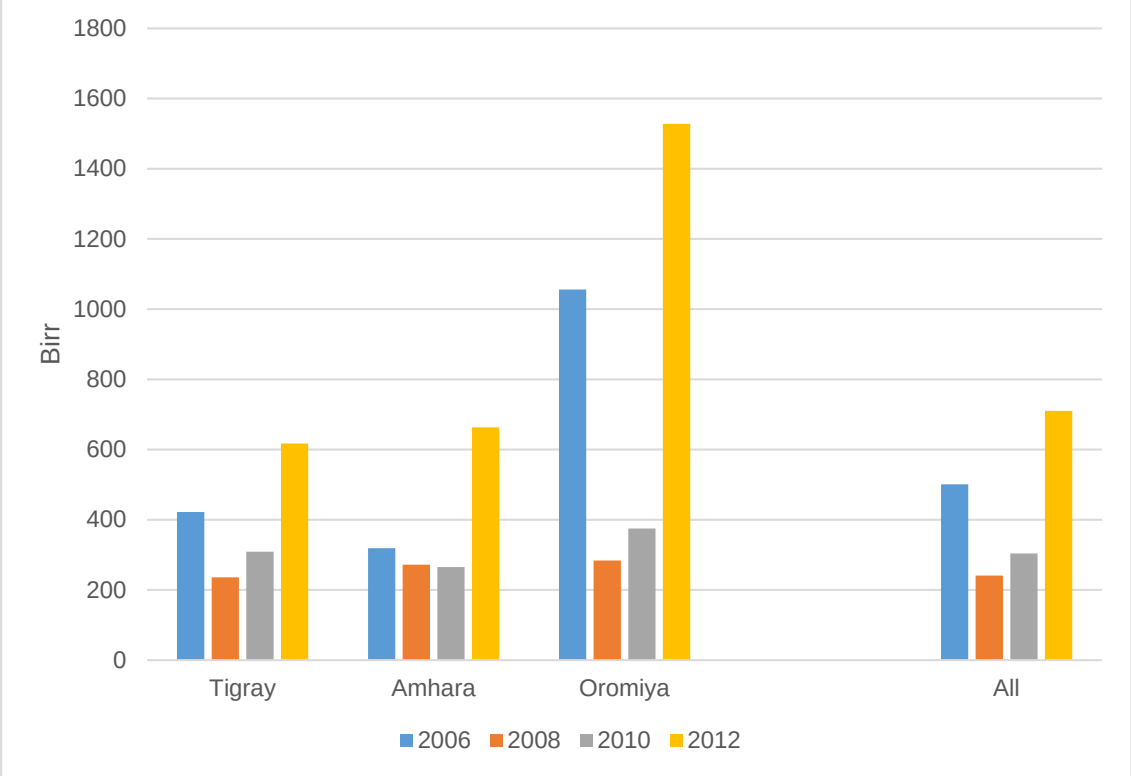
Figure 4: Comparison of normalized total payment to full family targeting entitlement in Oromiya, by household size (2009 and 2011)



Source: Berhane et al. (2013)

Figure 5 shows how payments made to direct support households follow the same pattern over time as those for public works beneficiaries, although these payments are considerably lower than those in Figure 2.

Figure 5: Median total payments to direct support households, by region and survey year



Source: Authors' calculations.

3.6 Summary

This chapter has provided a short description of the PSNP's design and operations, and draws heavily on our operational work for the Ethiopian government. There are several aspects of program implementation, as opposed to program design, that are relevant for our analysis.

The program was well targeted, so beneficiaries are poorer than non-beneficiaries. These means that we should be especially cautious when comparing unconditional means across PSNP participants and non-participants. We will also need to be careful about exactly how we define program participation: being a PSNP household in 2008 was clearly very different in terms of work requirements and payments from being a PSNP household in 2012. Benefit levels also differ markedly between public works and direct support households.

4. Insights from the qualitative fieldwork[10]

4.1 Overview

In this chapter, we present insights from our qualitative fieldwork in Tigray and Oromiya. They touch on several themes, including: attitudes toward schooling; how the PSNP affects school attendance and drop-out; and the effects of PSNP participation on child labor.

4.2 Schooling

4.2.1 The value placed on education

Both male and female focus group participants expressed interest in continuing their education, in particular to improve their socioeconomic status. However, the value that family members place on education affects a child's ability to dedicate time to study rather than household or farm work. A family's economic status and the number of family members influences the allocation of tasks and each child's labor burden. In many households, children cannot depend on academic support for their homework. Older siblings often take on tasks to allow younger children to study: they are expected to take on the greatest responsibility in household and farm work, which limits their time for study at home.

> [Question: Why do some children start school at the age of seven, but others later?]*. This problem comes from parents. Some families do not know about the usefulness of education, but others know. Those families who know about the usefulness of education send their children early and those who don't know about education send their child late.*
>
> Female participant, Lodie Hada (Oromiya)

> *I want to spend much of my time studying. If I am to follow the footsteps of my parents, I will have backward thinking. Even if I stay in agriculture, it is only through education that I could introduce change. I know people who have accomplished a lot through education. Because I want to reach a higher level, I want to spend much of my time in school. But due to family pressure, the attention I give my studies is low.*
>
> Male participant, Adisbeha (Tigray)

> *These three (chores, farm work and school) are our responsibilities. For me, the most important is education. If I was relieved from farm work, which is the most difficult, I would have time to do my studies effectively… but if we are do all three, being in school is only a formality; we are busy and our studies are affected.*
>
> Female participant, Adisbeha (Tigray)

[10] We thank Amy Margolies who oversaw the fieldwork summarized in this chapter.

Boys we surveyed expressed aspirations for professional careers such as doctors, teachers, and engineers. They viewed education as a means to avoid poverty and reliance on agricultural labor. Obstacles to education for both girls and boys include the lack of electricity to study at night, little academic support for homework and insufficient time for study due to household tasks.[11] Upper grade schools do not exist in some localities, and students must move or find transport to get to school in a different town. The lack of physical infrastructure in schools, as well as a dearth of materials and access to water, affect the quality of education provided. In one school in Tigray, the schoolmaster hoped to grow cash crops on school land to raise funds to support improved infrastructure, salaries and materials, but could not move this forward as there was no water source. School meals are not provided in the schools we surveyed, but were mentioned as a potential support to education, as many children walk long distances to school and may not have breakfast before they arrive.

4.2.2 Attendance

Respondents in both Oromiya and Tigray reported that school attendance depends heavily on parents' attitudes to education and whether they believe an education will improve their children's job prospects. Regular attendance is more likely in households that have enough labor support to share all the farm and domestic chores. The lack of employment options after graduation is a disincentive to complete school. In Oromiya, many respondents mentioned the opportunity for girls to migrate to the Middle East for work. In Tigray, respondents said that the short-term benefit of paid labor – an immediate income – carries more weight than the longer payoff of investing in education. In Tigray, paid labor opportunities included a Chinese-funded road project, a wind farm and other construction projects. Boys who are their family's only male child might also miss class to attend to farm activities.

> *The community has a problem in implementing what we teach; a problem of short-termism. There was a road construction project and grade 7–8 students worked for three days a week and attended [school] the other two [days]. This is a problem. We visit homes, but the parents tell us: we will send him to school one day but he must work the other day. We visit regularly, but the problem persists – although there are improvements.*
>
> Schoolmaster, Mezalet (Tigray)

Respondents indicated that participating in the PSNP may have a positive impact on attendance and enrolments, because it eases a household's financial restrictions, allowing them to invest in education. These results echo quantitative results on increases in expenditure on education (Berhane *et al.* 2013). As parents feel less financial strain, they permit their children to attend school more frequently. However, the increased work burden may displace time allocated to do homework. So, in some

[11] In Oromiya, one girl described how she rigged together a light bulb, four dry cell batteries, and other materials. She would hang this light from the ceiling to study at night.

cases, although the household work increases, the pressure for children to engage in outside paid employment is also somewhat lessened.

> *The safety net is beneficial to society. When parents join the program, although children's chores increase, it lets them go to school. Some children weren't going because they were poor. If the parents are in the safety net, they don't have problems buying materials (pens, books) and it allows children to attend school.*
>
> Female participant, Mezalet (Tigray)

Schoolmasters from both *kebele*s in Tigray also noted a positive impact of the PSNP on education in their schools.

> *Opportunities like the safety net are helpful. If the parents are working, then it is highly likely that they will send their children to school. They can help their children succeed in life.*
>
> Schoolmaster, Mezalet (Tigray)

> *My observation is that most families in the PSNP give more attention to education because they have work, and when they are working they can assure their food security. This means there is no problem at home. They work and solve their day-to-day problems, so they are able to fulfill their children's education material requirements.*
>
> Schoolmaster, Adisbeha (Tigray)

Participants also identified some potential downsides of PSNP on attendance and enrolment, particularly the increased work burden to replace adult household labor.

The following exchanges with girls from our Lodie Hada (Oromiya) focus group illustrates this:

> [Question: Do you think that in this area at the moment the time *you spend on household work has changed because of your family members working in the safely net?] She said that the safety net affects the time her parents spend on household activities. She added that when her mother went to safety net, the work she had to do at home [meant that] she may be absent from school. Generally, it affects the time burden on her. Another girl said: "I have to wait for my mother from safety net work and I might be absent from school." And she said the same as her friends had previously said: that generally she spends more time on household than field work.*
>
> [Question: Has that brought about change for boys too or only girls?] *No, it is only for girls because they [boys] don't do household activities.*
>
> [Question: What about farm work?] *PSNP is not in the harvest and ploughing seasons, so boys do not have work burden.*

[Question: Is there a difference in burden between younger children versus older children and younger girl and older girls?] *They said older girls.*

[Question: Has the time available to study at home changed since the start of safety net work?] *They said there is no change.*

[Question: Did they know anyone their age stopping school or dropping out because their family working on safely net program?] *They said never.*

Female participants, Lodie Hada (Oromiya)

In the rural area, if a family has three children and all attend the same school shift and the parents are going to public works; at times like the harvesting period, the family will be stretched as no one is there to do the work.

Female participant, Adisbeha (Tigray)

Schoolmasters did not report lowered enrolment or attendance for those students whose families participate in the PSNP.

The safety net is not directly related to schooling in other administrative issues. They fear that if they do not participate in such activities they may be out of the safety net, but in sending [their children to] school there is no difference between parents who work for the safety net and those who do not work for the safety net.

Headmaster, Sifaressa (Oromiya)

Additionally, a household's economic status will affect the time allocated for homework and out-of-school studying. While most children reported having less time for study after their parents joined the PSNP, a small handful reported that they now have more time. The variation in these responses may also be due in part to the size and structure of the household. In households with many children, the tasks may be divided up and less burdensome.

4.2.3 School dropout rates

Family and household structure affects the work burden that children carry. In an orphaned or single mother-headed household, the oldest boy is proxy for the father and must take on those responsibilities. Children note that the decision to enroll or drop out of school is greatly influenced by the value parents place on education. As many rural parents are uneducated or have low levels of education, household heads may encourage children to stop their schooling. Dropout is most common in grades 5–8, when students are old enough to undertake heavier tasks at home or paid work outside of the household.

Looking at the physical appearance of a person, it isn't possible to identify whether a person is literate or illiterate. Similarly, parents can't physically measure what their children knows or their mental capacity. But they can

measure the amount of flour they bring home. That is why they let their children drop out for short-term, visible benefits.

Schoolmaster, Adisbeha (Tigray)

Schoolmasters have the responsibility to collect information on student and teacher attendance as well as dropout rates. When students stop attending school, schoolmasters contact the *kebele* administration and try to inform parents of the negative impact of dropout. This approach is not always successful. Many students are also put off studying by the fact that many fail the 10th grade examination or cannot find jobs after graduation. The economic pressure is felt by both male and female students, despite pursuing different types or work. Many female dropouts in Tigray try to migrate to Middle Eastern countries, such as Saudi Arabia, for paid domestic work, while males may also migrate, or find paid labor locally or regionally.

Most of the female [dropout] students go to Saudi. The males also want to go, but when they cannot make it to Saudi, they go to places like the Afar region. By working in areas like Afar, they make good money, have nice clothes and a mobile. The other students dream of this; they also want to have that stuff. This influences students to dropout.

Schoolmaster, Adisbeha (Tigray)

While older students who enroll late into school are allowed to enroll or return to school after dropping out, it is not common for older students to do so. Some children start late because their parents worry about the long distances and safety when traveling from home to school, or because they cannot afford school materials or need them to work in the household. Those older children who enroll late start in the lower grades and progress alongside younger children on the same level of schoolwork. In one school, the schoolmaster does not permit enrolment past the age of 10, as the behaviors and learning styles of 7- and 10-year-olds are different and this can cause problems. In these cases, older children may attend adult basic education, but there is little interest in enrolling in such programs. Older children tend to seek economic opportunities instead and rarely return to education once they begin earning.

When older students drop out, they rarely return to school. They see that their friends who have dropped out have made money working and they are inclined to join them. But if they return, they can rejoin the grade level they dropped.

Male participant, Mezalet (Tigray)

Low grade attainment among girls is also affected by early marriage between the ages of 10 and 16. While early marriage is barred by law, it is still common in many rural regions. Once girls are married, they are often removed from school or leave permanently once they have children.

4.3 Child labor

One theme that emerges is the existence of gender norms with respect to some, but not all, activities. Domestic activities such as cooking and cleaning are generally defined by gender, with the household solely the woman's domain. Some farm work is also included among girls' household duties, with women and girls expected to work alongside the men in some farming chores. For example, girls in Oromiya noted that girls did the weeding, watering and cutting (harvesting) of pulses such as horsebeans and chickpeas; while boys ploughed and harvested other crops such as cereals. So, while both boys and girls help with farm work, boys are responsible for the most demanding physical tasks, such as caring for livestock, feeding, finding water sources and herding. Girls tend to help their mothers in household tasks such as making coffee, cooking stew, baking *injera* and cleaning, and support the boys' and men's farming activities. While boys do some household tasks – both boys and girls in the Oromiya focus groups mentioned fetching water many times – girls are seen to undertake more tasks than boys.

> *There is a difference and girls do more. The boys' jobs are fewerl but tough (like tilling land). The girls' jobs are many, but they look small (like making coffee, making stew, etc.).*
>
> Male participant, Mezalet (Tigray)

> *There is no equality between boys and girls. The girls have specific tasks which the boys don't share, like preparing food, making coffee, etc. Such things, the house chores, are only left to girls. But the girls share the boys' work in farm activities. So there is a heavy workload on girls.*
>
> Female participant, Mezalet (Tigray)

> *It's culture that protects the males from preparing food at home… It is a lack of knowledge by the community in general that restricts preparing injera and cooking to women.*
>
> Female participant, Lodie Hada (Oromiya)

However, if parents are old, sick or disabled, or if the household has a female head, boys shoulder a heavier share of the farmwork. Truancy occurs frequently during harvest time, when families are tilling, threshing and collecting the harvest. Respondents reported that these seasonal harvest time activities are the most time-consuming for boys. These periods of absenteeism may consist of several days during the season and, on the whole, affect both girls and boys. There is less farm work in the dry season than at harvest time, but sometimes children must drive cattle far distances to water sources, sleeping away from home and missing school. The distance of the household from the school and water sources also dictates a time burden and may affect attendance rates.

If parents are old or if there are young siblings, girls shoulder more domestic work and have less time to study. The burden on girls depends greatly on the number and gender of working age siblings in the family. If there are no boys, girls will help their

father with farming activities before going to school. This increases the burden for girls, as they participate in labor activities in both realms.

However, PSNP provides extra income, which allows poor households to allow children to stay enrolled in school and attending it more regularly, despite an increase in household or other work.

> *As you are required to cover your parents' work, it affects the time you need for study. You may not even get time to study, but the good thing with the safety net is it at least provides you the means to attend the school, rather than completely failing to attend. That means, since you have the educational materials, even with additional workload, you could still be in school.*
>
> Female participant, Mezalet (Tigray)

The workload is greater for older children, so younger children are less burdened by any extra household or farm labor caused by participating in the PSNP. If they have to work during the day, students might only be able to study very early in the morning or in the late evening. Students have some relief during the dry season, when there is less work and they can allocate more time to study. Children in urban areas report that all are expected to contribute towards household duties, but that only children with rich parents do not have household and farm work responsibilities. Children have very limited leisure time for play outside of the school environment because household labor demands dominate their time.

> [Question: Do you think the average time children spend on household or farm work has changed since their families work for the safety net?] *Since the safety net work is in the slack period where then are no big activities – that is, in April and May when farmers do not do anything – it does not affect us. If it were in peak time, it may affect us, but now it never does.*
>
> Male respondent, SifaRassa (Oromiya)

Although children are not permitted to supplement parental labor on the PSNP public works, they may, on occasion, substitute if a parent is briefly absent. But the children in both Tigray and Oromiya focus groups stressed that this was a rare occurrence.

4.4 Summary

This chapter has presented insights from our qualitative fieldwork in Tigray and Oromiya. Mindful that these are preliminary, they are suggestive of several avenues for further work.

The first relates to disaggregating our quantitative data by both sex and age. There are marked differences in the types of activities undertaken by boys and girls and by child age, with labor demands increasing as children get older.

The second relates to the composition of work. While children in our focus groups made repeated reference to domestic and farm work, few talked about paid employment outside the home. This is consistent with what we find in the quantitative data.

In terms of the impact of the PSNP, there are suggestions of overall positive impacts, but these may differ by age. Specifically, the impact of the additional work requirement may have an adverse effect on older children, particularly in female-headed households. This is something we can explore further with the quantitative data.

5. Impact of the PSNP on schooling and child labor

5.1 Introduction

Drawing on our material on the implementation of the PSNP (Chapter 3) and informed by our qualitative fieldwork (Chapter 4), this chapter assesses the PSNP's impact on schooling and child labor. We begin by explaining how our data were collected and with some descriptive statistics, followed by a general discussion of impact evaluation issues. We then go on to discuss, in depth, the IPWRA estimator we use in this chapter and explain how we apply it before presenting our findings.

5.2 Schooling overview: data and variables

The data we use in this chapter are drawn from the longitudinal household survey described in Chapter 2. We have data on schooling for all children within the households over the four rounds from 2006 to 2012 in three of the survey regions: Tigray, Amhara and Oromiya.[12] The schooling data consist of questions such as: whether or not the child is enrolled in school and is regularly attending; the highest grade completed; whether the child is pulled out of school at certain times in the year; the age at which the child started school; whether or the child dropped out of school and what age.

Table 4 gives details on the cleaned data we have on schooling by survey year, sex and region. We have data on 1,650–1,742 children across the four rounds in Tigray, 1,300–3,600 in Amhara, and about 1,800–2,200 children in Oromiya, with an average age of 10–11 years.

We begin by looking at the average numbers of children attending school by age, sex and the region where they live (Tables 5, 6, and 7).[13] For Tigray (Table 5), we find that, in 2006, attendance among 7-year-olds – the official age for starting school – was 37 percent for boys and 36 percent among for girls. These numbers fall to 23–28 percent in 2008 and 2010, but increase back to about 35 percent for boys and 39 percent for girls in 2012. Among boys, attendance peaks at about 70 percent among 13-year-olds and then starts to fall again. In 2012, this high attendance rate is achieved among boys aged 10 and does not fall below that level until about age 15.

[12] We faced considerable challenges cleaning these data, specifically with linking children across survey rounds. The survey enumerators did not always keep individual identifying numbers constant and this meant that we had to develop a suite of automated and manual data checks to ensure that we followed the same child from one round to the next. For Tigray, Amhara and Oromiya, this was a time-consuming and tedious process. Our efforts for the fourth region – SNNPR – were unsuccessful, so we do not include that region in this analysis.
[13] For brevity, we do not show all ages. Full results are available on request.

Attendance among girls is higher than boys at every age in 2006 (except for 7-year-olds) and peaks at 11 years. Comparing various age cohorts among girls between 2006 and 2012, we find that, with the exception of 11- and 16-year-olds, a larger fraction of each cohort is attending school by 2012.

Table 4: Number of observations, by sex and region

	Tigray					Oromiya			
	2006	**2008**	**2010**	**2012**		**2006**	**2008**	**2010**	**2012**
Boys	859	877	872	857	Boys	933	1,034	1,128	1,159
Girls	791	809	853	885	Girls	869	943	1,013	1,118
Total	1,650	1,686	1,725	1,742	Total	1,802	1,977	2,141	2,277
	Average age					**Average age**			
Boys	11.1	11.2	11.4	11.4	Boys	10.4	10.7	11.0	10.9
Girls	10.4	10.7	11.1	11.5	Girls	9.8	10.2	10.6	10.6

	Amhara			
	2006	**2008**	**2010**	**2012**
Boys	694	1,840	1,920	1,818
Girls	636	1,643	1,751	1,688
Total	1,330	3,483	3,671	3,506
	Average age			
Boys	10.4	10.8	11.2	11.5
Girls	10.1	10.5	11.0	11.0

Table 5: Current school attendance in Tigray, by age and sex

	Age	2006	2008	2010	2012
Boys					
	7	0.37	0.23	0.28	0.35
	9	0.46	0.71	0.64	0.68
	11	0.69	0.59	0.77	0.76
	13	0.70	0.78	0.62	0.82
	15	0.54	0.79	0.68	0.67
	16	0.59	0.63	0.72	0.72
Girls					
	7	0.36	0.26	0.24	0.39
	9	0.72	0.81	0.68	0.77
	11	0.86	0.85	0.84	0.80
	13	0.73	0.92	0.87	0.87
	15	0.58	0.63	0.8	0.82
	16	0.84	0.59	0.7	0.76

Table 6 describes attendance rates for children in Amhara, again disaggregated by age and gender. For boys, there is a sharp increase in attendance for those aged 7, 8 or 9, while (apart from a temporary jump in 2008 for boys aged 16) rates for older boys remain relatively unchanged. We also see a sharp increase in attendance among younger girls, but unlike boys, there is a modest increase in attendance rates among older girls. The attendance rates for girls aged 7 and aged 16 change markedly from year to year but we think this is a function of relatively small sample sizes (less than 40 observations per round).

Table 6: Current school attendance in Amhara, by age and sex

	Age	2006	2008	2010	2012
Boys					
	7	0.30	0.30	0.70	0.82
	9	0.42	0.46	0.85	0.87
	11	0.74	0.69	0.87	0.82
	13	0.80	0.83	0.80	0.80
	15	0.86	0.82	0.73	0.84
	16	0.75	0.93	0.73	0.74
Girls					
	7	0.33	0.17	0.92	0.90
	9	0.68	0.54	0.85	0.91
	11	0.83	0.79	0.96	0.90
	13	0.76	0.81	0.84	0.91
	15	0.86	0.89	0.86	0.80
	16	0.75	0.91	0.74	0.81

Table 7 shows attendance rates by age and gender for Oromiya. For both boys and girls, attendance rates rise between 2006 and 2012 but the rate and direction of change in the intermediate years is uneven. For example, for boys 11-15, attendance is relatively unchanged between 2006 and 2008 before rising markedly between 2008 and 2010. For younger boys (aged 7 and 9), attendance fell between 2006 and 2008, rose between 2008 and 2010 then rose again (for boys aged 7) but fell (for boys aged 9) between 2010 and 2012. Similar variability in changes over time is seen in girls' attendance.

Table 7: Current school attendance in Oromiya, by age and sex

	Age	2006	2008	2010	2012
Boys					
	7	0.59	0.33	0.69	0.83
	9	0.65	0.56	0.92	0.82
	11	0.57	0.56	0.84	0.92
	13	0.59	0.54	0.83	0.79
	15	0.38	0.41	0.77	0.71
	16	0.22	0.69	0.65	0.75
Girls					
	7	0.52	0.33	0.68	0.76
	9	0.69	0.53	0.57	0.86
	11	0.63	0.68	0.69	0.88
	13	0.53	0.71	0.85	0.74
	15	0.41	0.57	0.75	0.74
	16	0.47	0.53	0.65	0.82

Tables 8, 9, and 10 present the average number of grades children have completed by age and sex. There are several interesting patterns. In Tigray and Amhara, grade attainment generally rises over time. However, these gains are concentrated among older children. There are also some gender differences – again particularly among older children – with girls' grade attainment higher than boys'. For example, in Amhara, girls aged 15 have, on average, 4.6 grades of schooling compared to 3.4 grades for boys. In Tigray, boys aged 14 have 4.6 grades of schooling, while girls have completed 5.0. In contrast, grade attainment in Oromiya has been stagnant.

Table 8: Average grade attainment in Tigray, by age and sex

	Age	2006	2008	2010	2012
Boys					
	7	0.3	0.1	0.3	0.4
	9	1.0	1.0	0.9	1.5
	11	1.9	1.7	2.3	2.7
	13	2.4	2.6	2.8	4.0
	15	2.9	3.4	4.0	4.5
	16	3.0	3.6	4.3	5.1
Girls					
	7	0.4	0.2	0.1	0.4
	9	1.5	1.1	1.1	1.5
	11	2.3	2.3	2.4	3.1
	13	3.4	3.3	3.7	4.5
	15	2.9	3.9	4.6	5.5
	16	4.5	4.0	5.0	5.5

Table 9: Average grade attainment in Amhara, by age and sex

	Age	2006	2008	2010	2012
Boys					
	7	0.3	0.2	0.1	0.2
	9	0.6	1.0	0.8	0.8
	11	1.7	1.5	1.9	1.9
	13	2.6	2.4	2.4	3.0
	15	2.9	3.1	3.1	3.4
	16	3.8	3.2	3.3	3.5
Girls					
	7	0.3	0.2	0.2	0.4
	9	1.3	1.3	0.9	1.1
	11	2.4	2.2	2.3	2.2
	13	2.8	3.2	3.4	3.7
	15	3.7	3.6	4.1	4.6
	16	3.0	4.5	4.3	4.9

Table 10: Average grade attainment in Oromiya, by age and sex

	Age	2006	2008	2010	2012
Boys					
	7	1.05	0.80	1.25	0.92
	9	1.55	1.15	1.50	1.44
	11	2.52	2.03	1.81	2.18
	13	3.03	2.95	2.79	3.04
	15	3.51	3.02	3.41	3.20
	16	4.08	4.14	3.76	3.77
Girls					
	7	0.93	1.00	0.77	1.00
	9	1.65	1.38	1.85	1.89
	11	2.17	2.21	1.70	2.17
	13	2.85	2.76	2.76	2.86
	15	3.38	2.92	3.34	3.89
	16	3.23	3.38	3.67	3.09

Tables 11, 12, and 13 examine trends in schooling outcomes by household PSNP beneficiary status. We compare average schooling outcomes – such as those attending school, those who completed at least one grade and average grade attainment – among 9 to 16-year-old girls and boys in recipient and non-recipient households.

Table 11: Average schooling outcomes among 9–16-year-olds in Tigray, by PSNP status and sex

	PSNP status	2006	2008	2010	2012
Boys					
Fraction currently attending school	non-PSNP	0.51	0.67	0.67	0.70
	PSNP	0.70	0.75	0.73	0.77
Average grade attainment	non-PSNP	1.78	2.10	2.63	3.41
	PSNP	2.48	2.48	2.84	3.56
Fraction completed at least one grade	non-PSNP	0.62	0.66	0.87	0.90
	PSNP	0.74	0.80	0.93	0.91
Girls					
Fraction currently attending school	non-PSNP	0.70	0.78	0.74	0.80
	PSNP	0.77	0.80	0.80	0.83
Average grade attainment	non-PSNP	2.42	2.54	2.99	3.89
	PSNP	2.76	2.76	3.14	3.97
Fraction completed at least one grade	non-PSNP	0.70	0.78	0.92	0.92
	PSNP	0.78	0.87	0.95	0.93

Table 12: Average schooling outcomes among 9–16-year-olds in Amhara, by PSNP status and sex

	PSNP status	2006	2008	2010	2012
Boys					
Fraction currently attending school	non-PSNP	0.76	0.72	0.81	0.81
	PSNP	0.77	0.71	0.89	0.86
Average grade attainment	non-PSNP	1.19	1.63	2.01	2.54
	PSNP	2.10	1.85	2.31	2.95
Fraction completed at least one grade	non-PSNP	0.57	0.64	0.66	0.74
	PSNP	0.79	0.76	0.69	0.75
Girls					
Fraction currently attending school	non-PSNP	0.92	0.76	0.89	0.89
	PSNP	0.83	0.75	0.89	0.87
Average grade attainment	non-PSNP	1.90	2.36	2.75	3.32
	PSNP	1.84	2.46	2.94	3.40
Fraction completed at least one grade	non-PSNP	0.81	0.80	0.78	0.84
	PSNP	0.72	0.89	0.84	0.83

Table 13: Average schooling outcomes among 9–16-year-olds in Oromiya, by PSNP status and gender

	PSNP status	2006	2008	2010	2012
Boys					
Fraction currently attending school	non-PSNP	0.84	0.52	0.82	0.76
	PSNP	0.81	0.62	0.82	0.78
Average grade attainment	non-PSNP	2.00	1.72	1.42	2.01
	PSNP	1.63	1.75	1.59	1.75
Fraction completed at least one grade	non-PSNP	0.59	0.58	0.52	0.68
	PSNP	0.55	0.61	0.56	0.58
Girls					
Fraction currently attending school	non-PSNP	0.82	0.42	0.80	0.76
	PSNP	0.75	0.46	0.81	0.83
Average grade attainment	non-PSNP	1.31	1.23	1.08	1.55
	PSNP	0.80	1.17	1.25	1.39
Fraction completed at least one grade	non-PSNP	0.42	0.44	0.45	0.56
	PSNP	0.41	0.45	0.47	0.57

Across the three regions, there appears to be relatively little difference in unconditional attendance rates between children in PSNP and non-PSNP households. Over time, grade attainment rises in all regions, but there is no obvious sustained difference between PSNP and non-PSNP children in any region, although

grade attainment is lower in Oromiya than in other regions. There is no major difference between PSNP and non-PSNP children in the fraction who have completed at least one grade of schooling.

5.3 Trends in child labor and time allocation

This section provides a descriptive background of the nature and trends of child labor and time allocation in the PSNP. The data we use here was collected in the longitudinal survey described in Chapter 2. Enumerators specifically asked whether children: undertook domestic chores such as fetching water, firewood, cleaning, cooking and childcare; worked on the family farm, cattle herding or another family business; or worked for pay outside the household. They also asked how many hours children worked on these activities in a typical week. Using these data, we construct the following variables for the analysis in this subsection:

- Whether or not the child worked in: domestic tasks; family farm or business; or paid work outside the household.
- The average number of hours (and percentage thereof) children worked in each of these three activities in a typical week, disaggregated by region.
- The average number of hours (and percentage thereof) children worked in each of these activities disaggregated by PSNP status, number of years the households participated in the PSNP and levels of transfers made to the household.

Table 14 shows the total number of hours children aged 7 to 16 worked on family farm activities, domestic labor and off-farm work, by region and sex. Three patterns emerge:

- Unlike schooling, the number of hours children worked are similar across all regions, with the exception of Oromiya in 2008. We do not have any good explanation as to why this is lower than other regions or other years.
- Boys and girls worked similar total hours.
- In all regions, there is a secular trend toward working fewer hours. Between 2006 and 2012, hours worked per week fall by about 10 in Tigray, 7 in Amhara, and 6 to 8 in Oromiya.

Table 14: Total hours children aged 7 to 16 work per week, by region and sex

	Tigray		Amhara		Oromiya	
	Boys	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**
2006	33.5	32.0	31.6	29.7	30.5	31.6
2008	27.6	25.1	35.3	30.3	10.6	11.2
2010	26.0	24.9	32.4	26.5	31.9	29.9
2012	22.3	22.5	24.0	23.3	22.4	25.4

We found that the number of hours worked varies by child age sex, and region. In summary:[14]

- In Tigray, there is a pronounced difference in the number of hours worked by boys aged 7 boys aged 9–15. Apart from 2006, boys aged 7 worked about 15 hours per week while boys aged 9–15 worked between 22 and 33 hours with some variation by age and round.
- In Tigray, the age-hours worked gradient is more pronounced for girls, with older girls in each survey round working more hours than younger girls. For example, girls aged 9 worked around 18 hours per week while girls aged 15 worked 26 hours.
- In Amhara, unlike Tigray, there is a slight age-hours worked gradient for boys, with 9-year-old boys working more hours than 7-year-old boys, but fewer hours than older boys.
- In Amhara, the age-hours worked gradient is also more pronounced for girls, with older girls in each survey round working more hours than younger girls, although these differences are less pronounced than in Tigray.
- Trends in Oromiya are a little more difficult to discern because of the odd data for 2008. It appears that the reduction in hours worked between 2006 and 2012 by both boys and girls is concentrated among children aged 7 and 9.

When we look at how child labor is allocated across the different work categories – domestic work, activities on the family farm and off-farm paid employment – three findings are noticeable:[15]

- A very small percentage of child labor – 3 percent at most – is devoted to off-farm employment.
- While both boys and girls work in the house and on the family farm, there are differences. Boys spend around 25–30 percent of their time on domestic tasks and 70–75 percent on farm work; girls spend 60–65 percent of their time on domestic tasks and the rest on the farm.
- These allocations are stable across regions and across time.

Last, we compare the hours worked by children in households with and without employment in the PSNP's public works component (Figures 6, 7, and 8). We found no major differences in these unconditional means.

[14] Full results are available on request.
[15] Again, we have summarized our findings here. Full details are available on request.

Figure 6: Mean total hours children in Tigray aged 7 to 16 work per week, by sex and PSNP status (2006–2012)

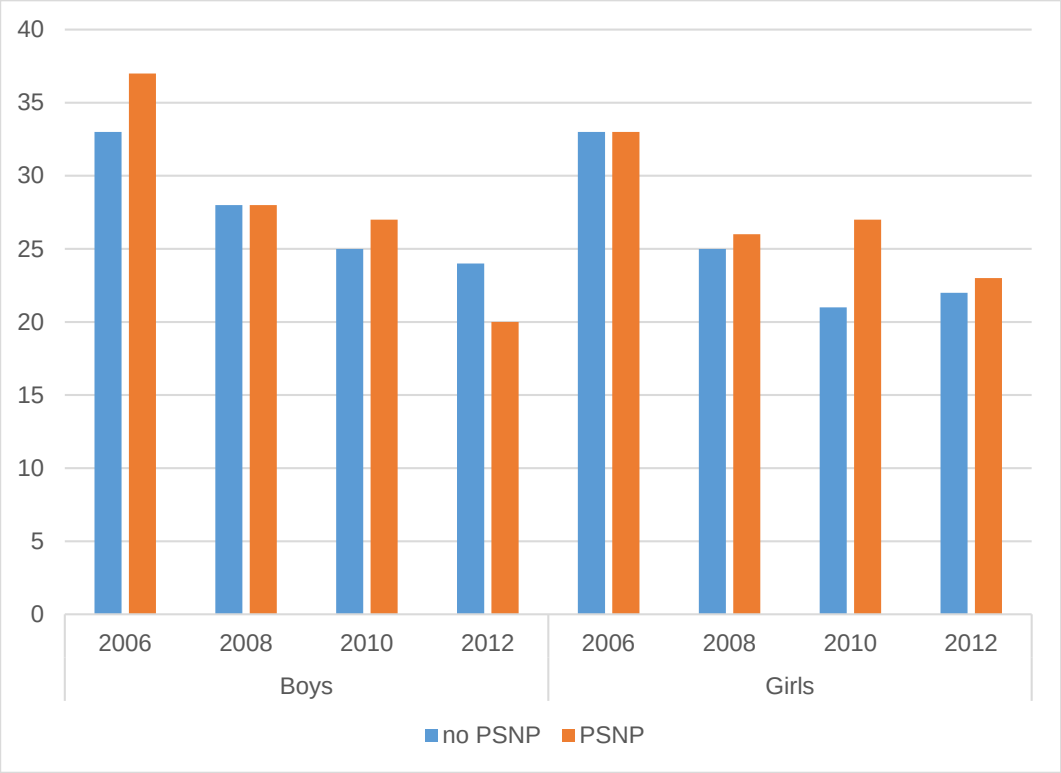


Figure 7: Mean total hours children in Amhara aged 7 to 16 work per week, by sex and PSNP status (2006–2012)

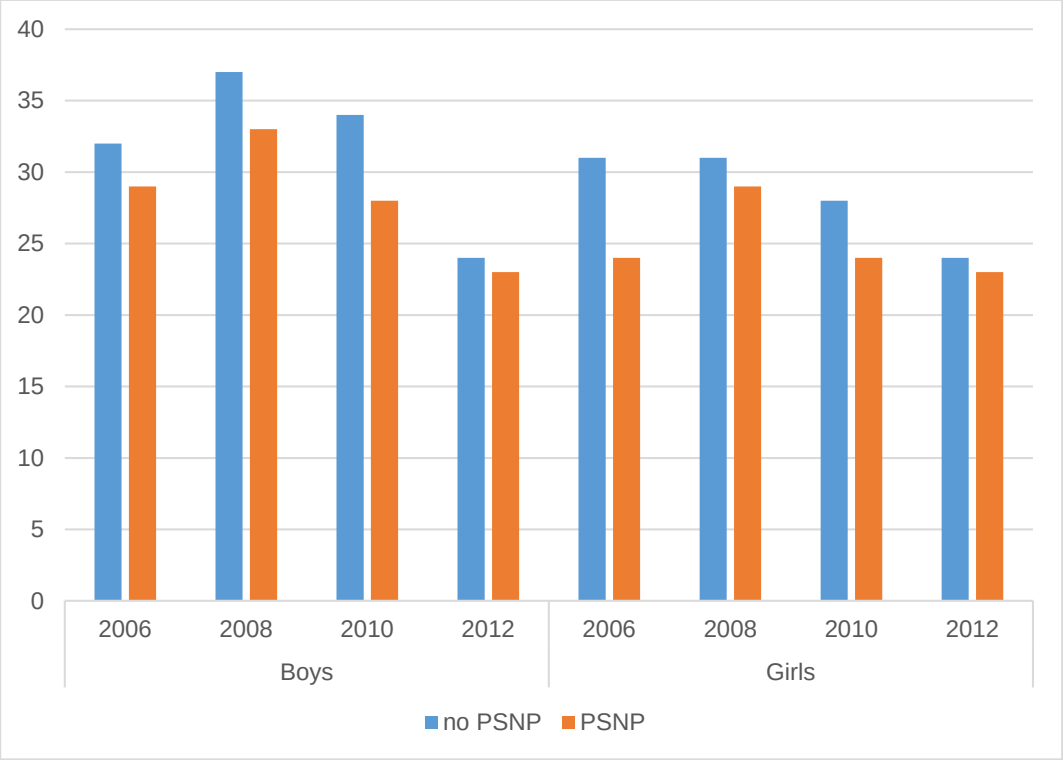
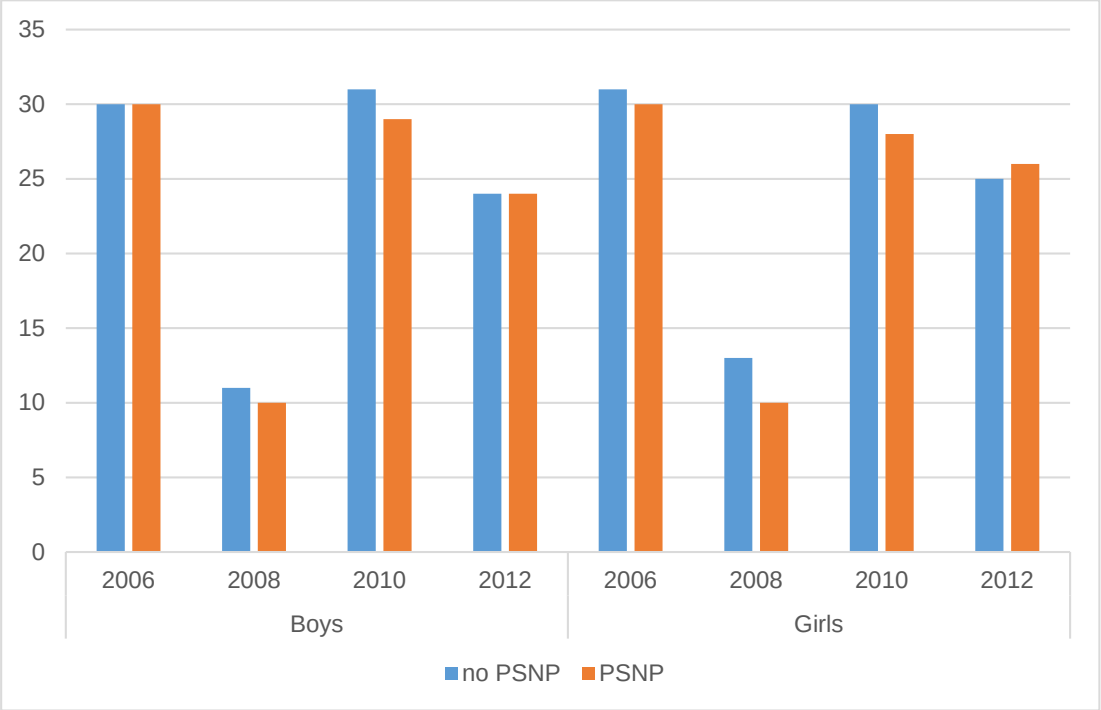


Figure 8: Mean total hours children in Oromiya aged 7 to 16 work per week by, by sex and PSNP status (2006–2012)



5.4 Impact evaluation issues: overview

The fundamental problem for a quantitative impact evaluation of a program like the PSNP is that we only observe what happens to beneficiaries who are receiving benefits; we do not observe what would happen to the same households if they did not receive benefits. This is called the problem of the counterfactual. A second issue is selection bias, which arises when beneficiaries differ in some systematic way from non-beneficiaries.

Our ability to make statements about the causal impact of the PSNP rests on how well we can address these two problems. Broadly speaking, there are four methods, which we consider in turn.

- **Randomized designs:** These are attractive because under certain conditions, they resolve the selection issue by design. However, the Ethiopian government refused from the outset to consider a randomized design for evaluating the PSNP.
- **Regression discontinuity design (RDD):** This requires a cut-off or threshold that separates beneficiaries from non-beneficiaries. The way the PSNP is targeted – using general criteria interpreted by local authorities (see Chapter 3) – precludes the use of RDD. In our quantitative and qualitative evaluation work, we explored with local officials how they implemented PSNP targeting. They did not use any simple quantitative mechanism to select beneficiaries, so there was no cut-off or threshold, making RDD unfeasible.

- **Instrumental variables (IVs):** This approach requires the identification of variables that affect the treatment variable directly but do not affect the outcome variable. Estimating IVs typically takes place in stages, by running two regressions. First, we regress the treatment variable on the IVs and variables that capture basic household and child characteristics. This first-stage regression gives us the prediction of the treatment based on the instruments and the basic household and child characteristics. In the second stage, we regress the outcome variable of interest on the prediction of the treatment variable obtained from the first-stage regression and the basic household and child characteristics.

- The IV approach is valid if the instruments satisfy two assumptions: they are good predictors of the treatment variable (for example, the level of payments); and they only correlate with the treatment variable and not the outcome variable of interest, other than through the treatment variable. We experimented extensively with IV estimators but could not find instruments that had sufficient explanatory power to predict the first-stage outcomes.

- **Matching estimators:** Having discounted the first three methods, we are left with matching methods. We discuss these in the next section.

5.5 Matching methods, including IPWRA estimators

Matching methods of program evaluation construct a comparison group by matching treatment households to comparison group households based on observable characteristics. We can then estimate the impact of the program 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.

When we started our PSNP work in 2006, we were aware that other impact evaluation methods were not likely to succeed. So we ensured that our surveys could support the use of matching methods. These provide reliable, low-bias estimates of program impact if:

(1) the same data source is used for participants and non-participants
(2) the data include meaningful X variables capable of identifying program participation and outcomes
(3) participants and non-participants have access to the same markets (Heckman, Ichimura and Todd 1997, 1998).

Because we applied the same survey instrument everywhere, we satisfied criterion (1). The biannual PSNP surveys were designed to include a rich set of variables to identify program participation and outcomes related to schooling and nutrition and other outcomes of interest, as required by criterion (2). We met criterion (3) by sampling treatment and control households within the sample *kebeles*, as noted in Chapter 2.

Matching can be accomplished in several ways. The best known – propensity score matching (PSM) – uses a fully specified probit regression to estimate the treatment model, or the process by which respondents are selected into the treatment or comparison groups. It then compares each treatment observation to only one control observation in computing the individual treatment effect. PSM uses a fully non-parametric technique to estimate the outcome model. The individual treatment effect is calculated as a simple difference between the outcome for the treatment unit and its nearest control unit. This estimate does not control for other variables that may also affect the outcome variable.[16]

In preliminary work, we estimated program impacts using PSM. However, the results reported in this document are based on IPWRA, a matching method that improves on PSM in two ways. First, the outcome model in IPWRA is fully specified and can include controls for the observations concurrent or baseline characteristics. For example, suppose we were interested in the effect of the PSNP on children's schooling. Unlike PSM, IPWRA allows the researcher to explicitly control for whether the child in the outcome model is male or female. Because PSM only looks at the difference between each treated unit and its nearest control unit as measured by the propensity score, it does not explicitly control for child's gender unless child's gender is included in the treatment model.

Due to the inclusion of these control variables, the improvement in IPWRA efficiency compared to PSM is analogous to the improvement in precision one finds when including additional covariates in the evaluation of a randomized control trial. While comparing the difference between outcomes in the randomly selected treatment and control groups is unbiased, including covariates to the treatment status absorbs variance, allowing a more precise estimate of the treatment effect. A further benefit is that we no longer have to ensure balance across the baseline covariates that appear in the probit used to estimate the propensity scores, because these also appear in the IPWRA.

Second, PSM compares each treatment observation to only one (or a few) control observations that have a similar likelihood of being treated, whereas IPWRA implicitly compares every unit to every other. In essence, PSM puts a weight of 1 on the nearest control observation and a weight of 0 on all other observations. IPWRA places higher weights on observations that have a similar likelihood of being in the treatment or comparison group and lower weights on observations that are dissimilar. This ability to include more observations in the model that compares a treatment unit to its hypothetical counter factual increases statistical precision.

[16] A second method is nearest neighbor matching (NNM) (see Abadie and Imbens 2006). Differences between NNM and PSM derive primarily from the rule used to select comparable non-beneficiaries and the weights used to construct the difference in weighted average outcomes. NNM, a form of covariate matching, matches beneficiaries to non-beneficiaries based directly on observable characteristics. Each beneficiary is matched to the group of non-beneficiaries with the smallest average difference in preprogram characteristics, where this difference is determined using a multidimensional metric across all control variables.

As well as being more efficient, the IPWRA is doubly robust. With PSM, if the treatment model is misspecified – in other words, if the model is missing a variable or the functional form is incorrect – PSM will provide inconsistent estimates. By contrast, if an IPWRA treatment model is misspecified, its estimates of the treatment effect will still be consistent, so long as the outcome model is not also misspecified. The reverse is also true: if the treatment model is appropriately specified but the outcome model is misspecified, IPWRA still delivers consistent estimates. While we are confident in all of our specifications, we appreciate this double robust property as fall back (Imbens and Wooldridge 2009).

IPWRA is accomplished in three steps:

1. Estimate the probability that an observation is treated using a treatment model, usually with a probit or logit regression. Use the predicted probabilities to re-weight the sample by the inverse of the probability that each observation is in the treatment or control group.
2. Estimate the expected outcome for each observation using a weighted outcome model that includes both the observable characteristics used to estimate the treatment model and additional information. For example, if the outcome of interest is child's schooling, the outcome model may include the child's age in addition to the household demographic characteristics that were included in the treatment model. You can also use baseline data on outcomes in this way to more precisely estimate treatment effects at endline. Use the outcome model to predict the expected outcome for each observation twice: once from the perspective (weights) of the probability of being treated and again from the perspective (weights) of the probability of being in the control group.
3. Calculate the average outcome for treatment and control observations: the difference between the two averages is the estimated treatment effect.

To see how IPWRA works, consider a very simple model of child schooling (Y) where this outcome is a function of child age (W). We have two groups of households, PSNP beneficiaries (B=1) and non-beneficiaries (B=0). We estimate these models of schooling for the two groups separately.

$$Y_{B=1} = \alpha_{B=1} + \beta_{B=1} W + \varepsilon_{B=1} \quad (1)$$

and

$$Y_{B=0} = \alpha_{B=0} + \beta_{B=0} W + \varepsilon_{B=0}. \quad (2)$$

We could estimate (1) and (2) separately and calculate predicted values for $Y_{B=0}$ and $Y_{B=1}$. Having done so, it would be tempting to take the difference in these predicted values and call that the impact of the PSNP. The problem, of course, is that beneficiaries are not randomly selected: there is correlation, for example, between

$\varepsilon_{B=1}$ and $\alpha_{B=1}$. We can resolve this by weighting these regressions.[17] This yields the average treatment effects on the treated.

5.6 Implementing the IPWRA estimators

Implementing IPWRA requires that we precisely define a PSNP beneficiary and estimate a model that predicts program participation. To do so, we draw on the material presented in Chapter 3.

To begin, recall that the PSNP has two components: public works and direct support. These differ in a number of important ways. Public works has a work requirement, while direct support is an unconditional transfer. The criteria for selection into these are somewhat different. Public works targets households that are poor (for example, they have low holdings of land and/or cattle) and food insecure, but also have able-bodied labor power. Direct support households are poorer than those receiving public works employment and their primary income earners are elderly or disabled so lack labor power. Direct support households received much lower payments than public works beneficiaries.

There is one additional consideration. Given the targeting used to identify direct support households, they tend to have few children. In fact, more than 85 percent of the children in our sample are from public works households. In the 2012 round, for example, 56 percent of direct support households had no children aged 7–15 and a mean of 0.6 children in this age range.

So we faced three choices:

(a) Include direct support households as part of the treatment group, which would mean we are assessing the impact of any type of household participation in the PSNP relative to non-participation.
(b) Define treatment as participation in the public works component and include all other households (including direct support ones) as potential controls.
(c) Define treatment as participation in the public works component, exclude all direct support households, and use households that receive no PSNP benefits as controls.

In preliminary work, we experimented with all three possibilities. Qualitatively – in terms of signs, magnitudes and statistical significance – it made no difference which of these we used. This was an unsurprising result, given that direct support households have such few children.

In the results we present below, we used (b). We defined beneficiary households as those who receive the PSNP's public works component. Our comparison households were not public works beneficiaries.

[17] See Imbens and Wooldridge(2009:38–39) where the weights are derived from the inverse propensity scores.

The next issue we needed to confront is whether we should pool our data across all survey rounds or estimate impacts by year. Payments data shown in Chapter 3 indicate significant differences in program implementation across years, making pooling inadvisable. For this reason, we decided to assess impact by year.

We used a probit model to predict program participation.[18] Based on the PSNP's targeting criteria, along with our assessment of how these have been implemented (see Chapter 3), we used the following covariates as predictors:

- household livestock holdings 12 months prior to the survey
- household landholdings
- age, sex and grade attainment of household head
- number of males aged 16–60 resident in the household
- number of females aged 16–60 resident in the household.

Schooling of the head, livestock and land holdings all capture dimensions of household wealth and these variables are strongly correlated with measures of household food security. We use livestock holdings as of 12 months prior to the survey to avoid the possibility that these are affected by receipt of PSNP transfers.[19] Age affects access to public works, as older households are more likely to receive direct support payments. Finally, since the public works component requires that households have labor power, we include the number of adult males and adult females aged between 16 and 60 as proxies for this.

Table 15 reports the results of this probit for the 2012 survey round.[20] As well as the covariates described above, we include (but do not report) locality (*woreda* or district) level dummy variables. This allows us to condition out local factors – such as the budget allocated to the PSNP in different localities – in our estimation of predicted probabilities. We have converted parameter estimates into marginal effects.

[18] In preliminary work, we also used a logit model; our results are not affected by the choice of prediction estimator.
[19] In Ethiopia, land is owned by the state and allocated to households on a usufruct basis, so holdings are not affected by PSNP status.
[20] Results for earlier rounds are available on request.

Table 15: Probit estimates (marginal effects) of correlates of participation in PSNP public works (2012)

Livestock holdings (tropical livestock units) 2011	-0.017***
	(0.007)
Land operated by the household	-0.024***
	(0.009)
Highest grade attained by household head	-0.011**
	(0.006)
Age household head	-0.004***
	(0.001)
Household head is female	0.063*
	(0.036)
Number of males aged 16–60	0.016**
	(0.008)
Number of females aged 16–60	0.025***
	(0.009)

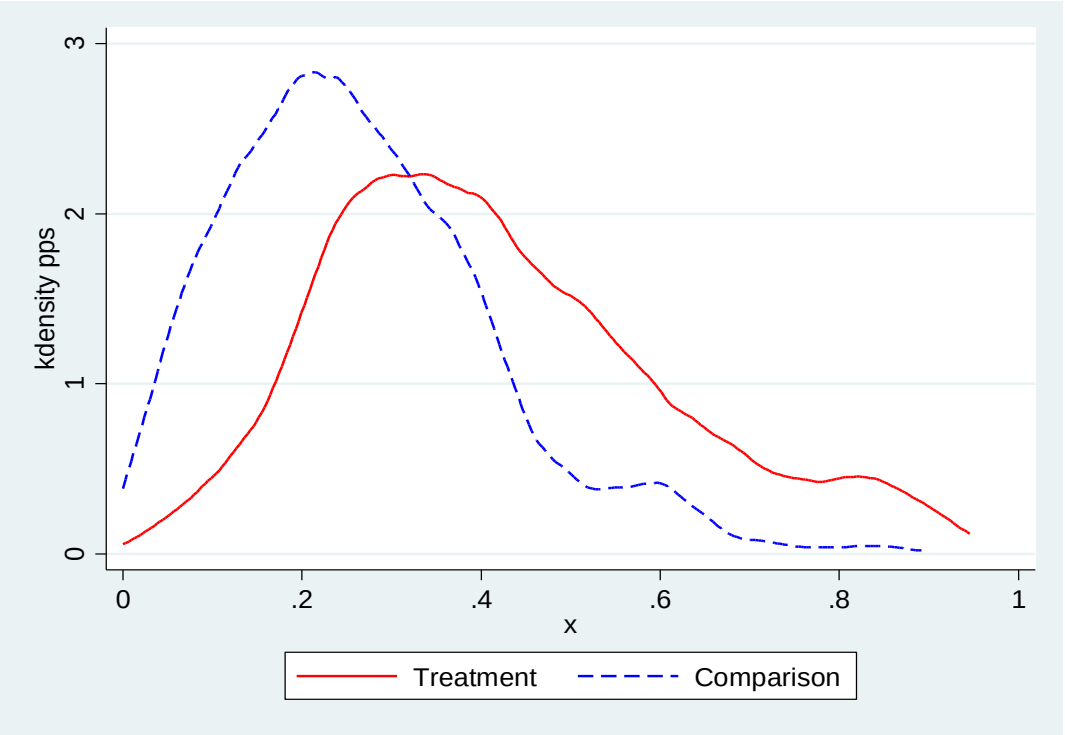
Note: * significant at the 10 percent level; ** significant at the 5 percent level; standard errors clustered at the *kebele* level; woreda dummy variables included but not reported.

Table 15 shows that the likelihood of participation falls for wealthier households (the coefficients on livestock, land and head's schooling are negative and statistically significant) and rises with the availability of labor power (number of adult males and females).

A requirement for the use of inverse propensity scores is that there is common support. In other words, the probability of being a participant (or non-participant) is both non-zero and less than one for all observations. One way of assessing this is to plot the propensity scores for both participants and non-participants and see if the distributions of these overlap. Figure 9 shows that they do.

Our regression adjustment estimates also include characteristics that affect child schooling and labor outcomes. These include child age, the number of children under six living in the household and locality characteristics that might affect either schooling or child labor: the number of primary schools in the locality; distance to the nearest secondary school; whether the local access road is paved; whether there is piped water; and the daily wage paid for adult male labor. In our schooling estimates, we include lagged levels of grade attainment. In preliminary work, we experimented extensively with the list of controls and found that adding or dropping controls did not substantively change the results we obtained.

Figure 9: Density functions showing common support, public works and comparison households (2012)



Before moving to our results, we note that, as with any method of estimating treatment effects, we made several assumptions to justify the use of IPWRA.

1. The conditional independence assumption must hold for the estimation of average treatment effects. This means that no unobservable variable affects both the likelihood of treatment and the outcome of interest, after conditioning on covariates. Because the IPWRA includes more covariates (in the outcome model) than the PSM (which only includes the covariates in the treatment model), this assumption is more likely to hold with IPWRA than with PSM.

2. The independently and identically distributed assumption must hold. This means that each individual's potential outcomes and treatment status are independent of all other individuals' potential outcomes and treatment status in the sample. This assumption must hold for both IPWRA and PSM.

3. The overlap assumption must hold. This means that every observation in the sample must have a positive estimated probability of being treated. This assumption must hold for both IPWRA and PSM, and because the IPWRA and PSM treatment models are often estimated using the same method – for example, probit or logit models – the assumption is theoretically equivalent for both methods. STATA 14, the statistical package we employ for our work, automatically restricts to observations in the common support. The plots of the estimated likelihood of treatment shown above indicate that we have common support.

5.7 Results

Recall from Chapter 3 that implementation of the PSNP – in terms of how many days households worked and how much they were paid – differed markedly across the survey years. In Chapter 4, we saw that children's work patterns and grade attainments differ by sex. And we note above that we want to control for lagged schooling. So we present results separately by year and by sex. Because we are controlling for lagged schooling – and we have no information on schooling prior to 2006 – we can only estimate impacts for 2008, 2010, and 2012.

We report the results for three outcomes – grade attainment and relative grade attainment (grade attainment divided by potential grades attained by a given age); hours worked per week in agriculture; and hours per week spent on domestic tasks – below. Given the gendered pattern of work, we separate these two types of work. We do not consider the impact on work undertaken outside the home, given – as we discussed earlier – that few children undertake such activities.[21]

In examining these results, there is a final issue to consider. Our descriptive statistics show that the patterns of schooling and work differ by child age. We need to be sensitive to this, so we do the following. Rather than use an arbitrary age cut-off, we begin by looking at outcomes for all children aged 8 to 16. We then gradually restrict the age range, dropping younger children from the sample. This means that for each outcome, we present 36 impact estimates: for six age groups (8–16; 9–16; 10–16; 11–16; 12–16; 13–16) by sex and by three survey rounds (2008, 2010, and 2012).

[21] Note that in preliminary work, we looked at impact on enrolment and attendance but did not find evidence of impact. These non-results are available on request.

Table 16: Impact of household public works participation on grade attainment, by sex and age

Age range	2008			2010			2012		
	Impact	Standard error	Sample size	Impact	Standard error	Sample size	Impact	Standard error	Sample size
Girls									
8–16	-0.19**	0.07	949	-0.14**	0.06	1,569	0.14	0.11	1,547
9–16	-0.22**	0.08	823	-0.13**	0.06	1,381	0.21*	0.13	1,402
10–16	-0.24**	0.09	731	-0.16**	0.07	1,202	0.32**	0.14	1,215
11–16	-0.27**	0.08	595	-0.19**	0.08	988	0.28**	0.13	1,014
12–16	-0.42**	0.10	483	-0.22**	0.09	833	0.26*	0.14	827
13–16	-0.25**	0.12	352	-0.20*	0.11	625	0.17	0.16	613
Boys									
8–16	-0.19**	0.07	1,023	-0.03	0.07	1,636	-0.09	0.08	1,568
9–16	-0.22**	0.07	878	-0.04	0.07	1,483	-0.09	0.09	1,394
10–16	-0.21**	0.08	778	-0.07	0.08	1,332	-0.04	0.10	1,210
11–16	-0.19**	0.09	653	-0.13	0.09	1,085	-0.05	0.10	1,048
12–16	-0.21**	0.09	548	-0.07	0.10	934	-0.09	0.11	893
13–16	-0.20*	0.11	421	-0.11	0.11	690	-0.05	0.13	658

Note: * significant at the 10 percent level; ** significant at the 5 percent level.

Table 17: Impact of household public works participation on relative grade attainment, by sex and age

Age range	2008 Impact	2008 Standard error	2008 Sample size	2010 Impact	2010 Standard error	2010 Sample size	2012 Impact	2012 Standard error	2012 Sample size
Girls									
8–16	-0.033*	0.019	949	-0.018	0.021	1,569	0.048	0.041	1,547
9–16	0.001	0.011	823	-0.007	0.017	1,381	0.068**	0.028	1,402
10–16	-0.010	0.009	731	-0.020	0.015	1,202	0.094**	0.027	1,215
11–16	-0.014	0.008	595	-0.022	0.015	988	0.065**	0.023	1,014
12–16	-0.006	0.006	483	-0.027*	0.015	833	0.057**	0.022	827
13–16	0.005	0.005	352	-0.024	0.016	625	0.048**	0.022	613
Boys									
8–16	0.005	0.023	1,023	0.012	0.024	1,636	-0.015	0.025	1,568
9–16	-0.002	0.012	878	0.014	0.019	1,483	-0.023	0.022	1,394
10–16	-0.001	0.009	778	0.000	0.018	1,332	-0.002	0.021	1,210
11–16	-0.004	0.007	653	-0.018	0.018	1,085	-0.006	0.020	1,048
12–16	-0.007	0.006	548	-0.004	0.016	934	0.015	0.018	893
13–16	-0.008	0.005	421	-0.012	0.016	690	-0.008	0.018	658

Note: * significant at the 10 percent level; ** significant at the 5 percent level.

Table 18: Impact of public works participation on hours worked per week on family farm activities, by sex and age

Age range	2008			2010			2012		
	Impact	Standard error	Sample size	Impact	Standard error	Sample size	Impact	Standard error	Sample size
Girls									
8–16	2.27**	0.84	1,414	0.92	0.90	1,831	0.21	0.76	1,949
9–16	1.79**	0.92	1,206	0.86	0.94	1,579	0.45	0.79	1,736
10–16	2.06**	0.98	1,060	1.02	1.00	1,368	1.32	0.81	1,495
11–16	2.39**	0.97	872	1.07	1.03	1,118	1.39	0.87	1,241
12–16	1.21	1.02	705	2.02*	1.33	942	1.74*	0.96	1,017
13–16	1.19	1.28	505	2.40*	1.32	701	1.54	1.23	759
Boys									
8–16	0.40	1.20	1,623	1.22	1.18	1,926	-0.02	0.86	1,980
9–16	1.50	1.36	1,373	0.94	1.32	1,717	-0.36	0.91	1,749
10–16	1.15	1.46	1,231	1.43	1.40	1,537	-0.81	0.98	1,515
11–16	2.41	1.63	1,004	1.98	1.57	1,246	-0.75	1.03	1,303
12–16	2.35	1.74	840	1.33	1.71	1,071	-1.30	1.13	1,105
13–16	3.14**	2.04	649	0.41	2.07	791	-3.14**	1.32	819

Note: * significant at the 10 percent level; ** significant at the 5 percent level.

Table 19: Impact of household public works participation on hours worked per week on domestic tasks, by sex and age

Age range	2008			2010			2012		
	Impact	Standard error	Sample size	Impact	Standard error	Sample size	Impact	Standard error	Sample size
Girls									
8–16	-0.78	0.93	1,414	0.90	0.87	1,831	-0.05	0.82	1,949
9–16	-0.84	0.96	1,206	0.69	0.95	1,579	0.05	0.86	1,736
10–16	-0.72	1.03	1,060	1.33	1.00	1,368	-0.74	0.90	1,495
11–16	-1.19	1.18	872	1.21	1.09	1,118	-0.46	0.95	1,241
12–16	-1.07	1.39	705	2.47**	1.22	942	-0.23	1.04	1,017
13–16	-1.42	1.77	505	1.42	1.40	701	0.69	1.22	759
Boys									
8–16	-0.87	0.73	1,623	-1.22	0.84	1,926	-2.05**	0.78	1,980
9–16	-1.07	0.86	1,373	-1.23	0.96	1,717	-2.45**	0.84	1,749
10–16	-1.83**	0.93	1,231	-1.52	1.04	1,537	-2.27**	0.91	1,515
11–16	-2.77**	1.16	1,004	-2.22*	1.21	1,246	-2.10**	0.98	1,303
12–16	-2.23*	1.34	840	-2.09*	1.27	1,074	-1.59	1.06	1,105
13–16	-1.84	1.31	649	-3.46**	1.55	791	-2.18*	1.29	819

Note: * significant at the 10 percent level; ** significant at the 5 percent level.

5.7.1 Impact results on grade attainment and relative grade attainment

We will start with the results for girls. Table 16 tells us that in 2008, household participation in public works reduced girls' grade attainment by 0.19 to 0.42 grades, depending on the age range. These negative impacts are statistically significant. These effect sizes are relatively large, given that mean grades attained for non-PSNP children was only 1.52. The negative impacts for girls persist in 2010, but the magnitudes are smaller, 0.13 to 0.22. In 2012, the impact is positive, with an increase of 0.14 to 0.32 grades. Mean grade attainment for girls in non-PSNP households in 2012 was 2.15 grades, representing an increase of 6 to 14 percent, depending on the age of the child.

Table 17 examines a related concept: relative grade attainment. This tells us whether children are progressing as fast as they should, given their ages. For example, a 9-year-old should have completed at least two grades of schooling. So a 9-year-old who had completed two grades of schooling would have a relative grade attainment of 1.0, while a child who had completed one grade would have a relative grade attainment of 0.50. Relative grade attainment is a measure of schooling efficiency. Table 17 tells us that PSNP participation in 2012 improved the speed at which girls progressed through school. Mean relative grade attainment is around 0.50, so the results of Table 17 indicate that the PSNP improved girls' schooling efficiency by 10 to 20 percent.

We also examined the PSNP's impact on other measures of schooling, such as whether girls were enrolled, had dropped out and had completed at least one grade of schooling. The only other outcome where we found statistically significant effects were completion of at least one grade of schooling in 2012. PSNP participation raised the likelihood of older girls (those aged 10–16, 11–16, and so on) attaining at least one grade by 7 to 10 percentage points. These effects were statistically significant at the 5 percent level.

The impact on boys' schooling follows a different pattern. In 2008, household participation in public works reduces grade attainment by 0.20 grades, a smaller magnitude than the impact on girls. In 2010 and 2012, there is no impact on boys' grade attainment. There is no effect on relative grade efficiency and no impact on whether boys were enrolled, had dropped out or had completed at least one grade of schooling.

5.7.2 Impact results on domestic tasks and the family farm

Table 18 suggests that the impacts on time spent on farm labor change over time. In 2008, the PSNP raises the number of hours children spend on these activities by two to three hours per week, with the exact number varying according to age and sex. By 2012, these increases have largely dissipated with only one positive and (marginally) statistically significant estimate – girls aged 12–16 – and only one negative and statistically significant estimate: boys aged 13–16.

Table 19 shows that household PSNP participation has little effect on the hours girls spend on domestic tasks; only one estimate out of 18 is statistically significant. By contrast, the PSNP reduces the number of hours boys spend on domestic tasks by approximately two hours per week. This is roughly equivalent to a 10 percent reduction in hours worked.

Why do we observe these heterogeneous effects of PSNP participation on schooling and labor? One possible explanation relates to the way the PSNP was implemented over this period. Recall that Figure 1 shows that total household employment rises from 45 days in 2006 to 60 days in 2008 and 75 days in 2010. Figure 2 shows that median payments in 2006 were 478 birr and 518 birr in 2008. In other words, work requirements increased by 33 percent between 2006 and 2008 while payments, in real terms, rose by less than 10 percent. In contrast, median days worked in 2010 and 2012 were the same (75 days) but median payments rose from 597 to 1,736 birr, a nearly threefold increase. If children’s schooling and leisure, particularly girls' schooling, is a normal good, then we would expect this positive income shock to translate into more schooling and reduced child labor, which is what we observe.

5.8 Summary

In this chapter, we use an IPWRA estimator to assess the PSNP's impact on schooling and child labor. IPWRA has two attractive features: it is doubly robust to misspecification of either the treatment or the outcome model and the inclusion of covariates in the outcome model improves statistical precision.

Our key finding is that the PSNP's impact on these outcomes is not constant over time or across the sexes. In 2008, when PSNP payments were low relative to work requirements, participation in the PSNP lowered grade attainments for both boys and girls. It caused increased child labor on the family farm, although for boys, this was offset by reductions in domestic labor. As PSNP payments increased relative to PSNP work requirements, especially in 2012, these adverse outcomes were reversed. In 2012, the PSNP increased girls’ grade attainment between 6 and 14 percent (depending on the child's age), improved schooling efficiency by 10 to 20 percent and reduced labor burden among boys.

6. Impact of the PSNP on children's nutritional status

6.1 Data

In the 2008, 2010 and 2012 survey rounds, we obtained anthropometric measures for all children living in respondent households aged six months to five years. Enumerators measured the length of children under 24 months and the height of children aged 24 to 60 months. Children were weighed wearing light clothing. We have cleaned the data from all rounds and regions. Table 20 gives the number of children measured by survey round and sex. Sample sizes are large, but because the sample is a panel, it ages over time, and the number of children observed declines.

Table 20: Number of children measured and weighed

Number	2008	2010	2012
Girls	1,722	1,556	1,317
Boys	1,677	1,561	1,355
All	3,399	3,117	2,672

Source: Authors' calculations.

We converted the height and weight measurements to Z-scores using the World Health Organization (WHO) growth standards (WHO 2006; de Onis *et al.* 2007). These allow us to assess child height and weight relative to well-nourished children of the same age and sex. A Z-score expresses these measures in terms of standard deviations. For example, we calculate the HAZ by taking the child's height and subtracting the median height of a reference population of children of the same age and sex and dividing this by the standard deviation for that reference population. Children with positive Z-scores are taller than the reference population. Those with negative Z-scores are shorter.[22]

Children are considered to be chronically undernourished (stunted) if they have an HAZ below –2; in other words, if, given their age and sex, their height is two standard deviations below the median height for a child of the same age and sex. Chronic undernutrition reflects the malign synergistic effects of continued inadequate food intake together with repeated infection. Over a protracted period of time, the child's body fails to receive sufficient nutrients – calories and micronutrients – to grow and/or the need to fight repeated infections diverts energy that would otherwise be used for growth. A child never fully recovers physical growth lost in the first two years of life. There is a growing body of evidence indicating that chronic undernutrition leads to irreversible neurological damage that adversely affects schooling and economic productivity (Hoddinott *et al.* 2013). Children are considered to be acutely undernourished (wasted) if their WHZ is below –2; in other words, if, given their

[22] See de Onis *et al.* (2007) for details.

height, their weight is two standard deviations below the median height for a child of the same age and sex. Acute undernourishment is more sensitive to recent episodes of illness or inadequate food intake.

Several features of these measurement data are worth bearing in mind. Enumerators widely followed the instructions, weighing 91 percent of children wearing light clothing without any meaningful difference in this practice across the years. They also largely followed the practice of measuring the length rather than the height of very young children, but they did not always strictly adhere to these guidelines with older infants up to the age of 24 months. Although they measured some 95 percent of 6-month-olds lying down, 50 percent of 23-month-olds were measured standing up. That means only 74 percent of 6–23 month-olds were measured correctly, leaving the potential of introducing some measurement error into the height data.

A much greater concern is that few births are registered. Only 1.5 percent of children had a birth certificate and only 3.8 percent had their birth date recorded on a clinic card. In 86 percent of cases, caregivers gave their best recollection of when the child was born. Few could give exact information, including date, month and year. Since we describe children's heights relative to their age and sex, this also introduces measurement error into these data. This is compounded by the mothers' tendency to report ages in full years, particularly for older children. In our analysis, we address the potential confounding effects of these measurement errors by following the convention of dropping children with Z-scores below -5.5 and above 5.5 and assessing the robustness of our empirical results by controlling for how data on ages were obtained.

The 2010 and 2012 surveys also collected data on the diets of children aged 6–24 months, using a similar format to other nutrition surveys in Ethiopia. Enumerators had a list of foods – such as eggs – or food groups, such as any foods made from beans, peas, lentils, nuts or seeds and asked mothers if the child had consumed each item the day before, during the day or at night.

The 2010 and 2012 surveys also included a brief section on whether children aged 6–24 months had presented any of the following symptoms in the previous two weeks: fever; cough/cold; fast breathing/shortness of breath; or diarrhea.

6.2 Basic descriptive statistics

Table 21 shows the mean values for children's HAZ, stunting, WHZ and wasting. There was no change in mean HAZ between 2008 and 2010, although it did improve between 2010 and 2012 by approximately 0.1SD.[23] The percentage of stunted children rose slightly between 2008 and 2010 before falling in 2012. The difference in stunting prevalence between 2010 and 2012 is statistically significant at the 10 percent level. Mean WHZ declines by approximately 0.1SD between 2008 and 2010.

[23] As discussed in Chapter 2, there were some changes to the sample between 2008 and 2010 and again between 2010 and 2012. We re-ran these descriptive statistics, restricting the sample to children whose households were surveyed in all rounds. Doing so does not substantively change the results reported here.

The percentage of wasted children drifts lower between 2008 and 2012, from 16.6 percent in 2008 to 15.5 percent in 2012. These values are broadly comparable to those found in the 2011 Ethiopia Demographic and Health Survey (DHS) (CSA and ICF International 2012), which showed that in all rural areas, mean HAZ and stunting were -1.8 and 46.2 percent, respectively. However, while the 2011 DHS showed somewhat higher (-0.6) mean values of WHZ across all rural areas, it also showed a lower prevalence of wasting, at 10.2 percent.

Table 21: Mean values of HAZ, stunting, WHZ and wasting

	Mean HAZ	Stunted (%)	Sample size	Mean WHZ	Wasted (%)	Sample size
2008	-1.91	47.9	3,088	-0.53	16.6	3,203
2010	-1.90	50.9	2,893	-0.44	16.0	2,999
2012	-1.81	48.8	2,524	-0.43	15.5	2,580

Table 22 disaggregates these results by sex. We observe similar temporal patterns for boys and girls in terms of our measures of chronic undernutrition: HAZ and stunting. Acute undernutrition measures – WHZ and wasting – improve for girls but not for boys. The 2011 Ethiopian DHS mean values for stunting are 42.5 percent for all girls (rural and urban) and 46.2 percent for all boys. These are lower than our results, but this difference is to be expected, given that chronic undernutrition is lower in urban areas.[24] Similarly, DHS values for wasting are also lower, at 8.2 percent for girls and 11.1 percent for boys. Consistent with the DHS, in the PSNP data, unconditional mean values for chronic and acute undernutrition are worse for boys than for girls.

Table 23 disaggregates these descriptive data by survey round and region. Consistent with what we observe in the DHS, stunting is highest in Tigray and lowest in Oromiya. There are regional differences in wasting, but these are less pronounced than the differences in stunting. In Tigray, Amhara, Amhara-HVFB and Oromiya, both HAZ and stunting worsen between 2008 and 2010 before improving between 2010 and 2012. The temporal pattern is slightly different in SNNPR, where chronic undernutrition improves between 2008 and 2010 but does not change between 2010 and 2012.

[24] The DHS does not report gender disaggregated results for rural areas.

Table 22: Mean values of HAZ, stunting, WHZ and wasting, by sex

	Mean HAZ	Stunted (%)	Sample size	Mean WHZ	Wasted (%)	Sample size
Girls						
2008	-1.87	49.6	1,529	-0.49	15.3	1,591
2010	-1.87	51.5	1,459	-0.40	14.2	1,505
2012	-1.78	48.5	1,291	-0.35	13.2	1,327
Boys						
2008	-1.94	52.5	1,559	-0.57	17.8	1,612
2010	-1.93	50.6	1,434	-0.48	17.7	1,494
2012	-1.85	49.3	1,233	-0.51	18.0	1,253

Table 23: Mean values of HAZ, stunting, WHZ and wasting, by region

	HAZ			Stunting (%)		
	2008	**2010**	**2012**	**2008**	**2010**	**2012**
Tigray	-2.18	-2.29	-2.17	58.6	60.7	57.8
Sample size	546	483	396			
Amhara	-1.79	-1.86	-1.92	47.5	50.3	49.2
Sample size	415	370	364			
Amhara HVFB	-1.94	-2.05	-1.92	53.6	55.0	51.9
Sample size	689	562	459			
Oromiya	-1.71	-1.80	-1.53	46.1	47.9	42.8
Sample size	750	770	682			
SNNP	-1.94	-1.69	-1.76	50.2	46.2	47.3
Sample size	641	660	581			
Total	-1.90	-1.91	-1.81	51.1	51.4	48.9
Sample size	3,041	2,845	2,482			
	HAZ			**Wasting (%)**		
Tigray	-0.63	-0.57	-0.23	17.8	17.9	16.3
Sample size	568	496	404			
Amhara	-0.47	-0.50	-0.50	15.6	15.9	13.4
Sample size	423	395	367			
Amhara HVFB	-0.81	-0.63	-0.73	17.9	21.0	19.8
Sample size	698	581	474			
Oromiya	-0.47	-0.41	-0.63	16.6	15.9	17.4
Sample size	783	804	691			
SNNP	-0.27	-0.14	-0.06	14.8	9.7	11.1
Sample size	683	669	602			
Total	-0.53	-0.43	-0.43	16.6	15.9	15.6
Sample size	3,155	2,945	2,538			

We consider the pattern of children's nutritional status by child age, using a non-parametric technique to smooth out these data. This allows us to graph confidence intervals, as shown in Figure 10.

Figure 10: Length and height-for-age Z-score, by age

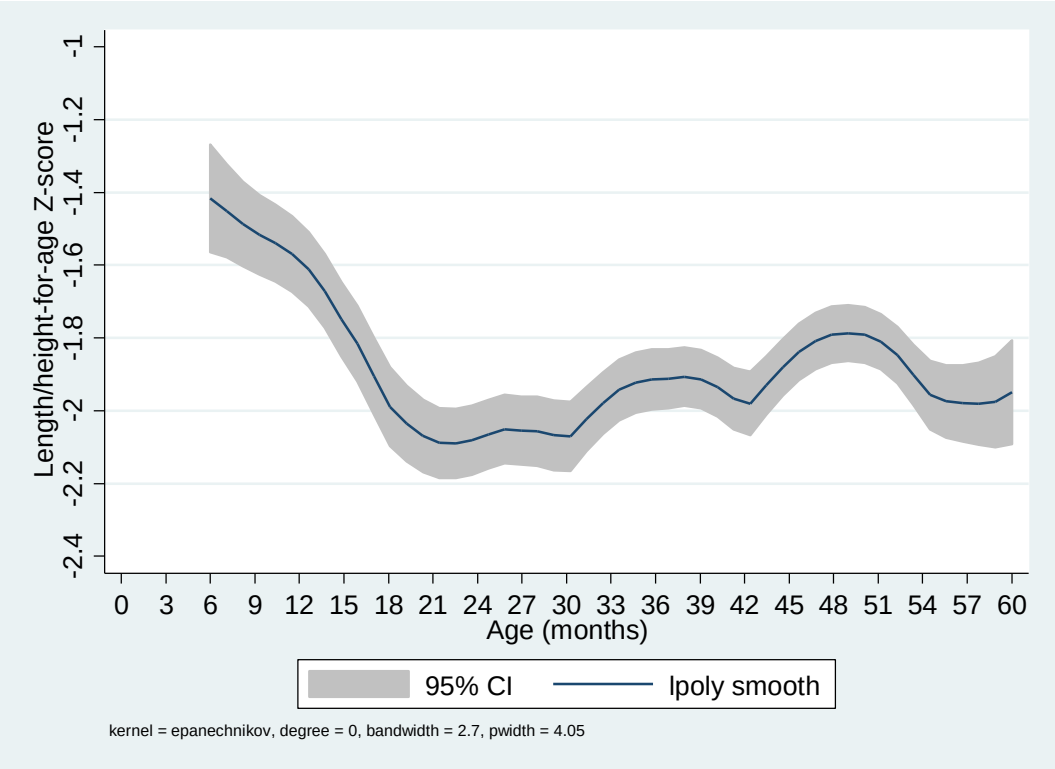


Figure 10 starts with children aged six months. Even at this early age, there is evidence of significant problems of chronic undernutrition with the predicted mean HAZ already below -1.4. HAZ declines rapidly between 6 and 24 months, after which it essentially levels out, sometimes bouncing a little higher, sometimes a little lower, as we move on to children aged 24 to 60 months. Ignoring these somewhat random fluctuations, what stands out is the swift decline from ages 6 to 24 months and just how bad chronic undernutrition is in this population.

Last, we consider the unconditional mean estimates of children's nutritional status by survey round and PSNP status. Table 24 indicates that, using either HAZ or stunting as the measure, chronic undernutrition is slightly higher in PSNP households than non-PSNP households. This is true in all survey rounds. Acute undernutrition, using either WHZ or wasting as a measure, is essentially the same in PSNP and non-PSNP households.

Table 24: Mean values of HAZ, stunting, WHZ and wasting, by PSNP status

	HAZ	Stunting (%)	WHZ	Wasting (%)
2008				
PSNP households	-1.87	49.7	-0.54	17.4
Non-PSNP households	-1.72	46.6	-0.56	16.0
2010				
PSNP households	-2.03	53.6	-0.44	15.5
Non-PSNP households	-1.79	48.9	-0.42	16.3
2012				
PSNP households	-1.88	50.9	-0.52	16.8
Non-PSNP households	-1.77	47.6	-0.38	15.0

6.3 Impact of PSNP participation on children's nutritional status

We now consider the impact of PSNP participation on children's nutritional status (Tables 25, 26, and 27), using the same general approach that we used to explore its impact on schooling and child labor. Rather than providing a detailed explanation of this approach, we reprise the key points here.

In brief, the only feasible approach available to us is matching. We use an IPWRA estimator. As well as being more efficient than standard PSM, the IPWRA is doubly robust to misspecifications of the treatment and the regression adjustment models. We focus on participation in the PSNP's public works component because nearly all the children in our sample are in that part of the program. We use the same covariates as we did in Chapter 5 to predict treatment: household livestock holdings 12 months prior to the survey; household landholdings; age, sex, and grade attainment of the household head; number of males aged 16–60 in the household; number of females aged 16–60 in the household; and *woreda* fixed effects.

Our regression adjustment estimates also include characteristics that affect child nutritional status, such as: child age and sex; maternal age and schooling; controls for measuring age, height and weight; housing quality; and locality characteristics such as having a government health post, availability of piped water and whether the local access road was paved.

As we did with our schooling estimates, we experimented extensively with the list of controls, but found that adding or dropping controls did not substantively change the results. We estimated impacts by survey round, given the substantial differences in program implementation described in Chapter 3. We also estimated these models for all children and for children aged 6 to 24 months, as the latter are seen to be of particular risk of undernutrition (Hoddinott *et al.* 2013).

Table 25: IPWRA estimates of the impact of PSNP public works participation on child nutritional status (2012)

	Child age			
	6–59 months			6–24 months
	All children	Girls	Boys	All children
HAZ	0.089	-0.255	0.121	0.260
	(0.110)	(0.155)	(0.154)	(0.201)
Stunting	-0.024	0.033	-0.001	-0.039
	(0.029)	(0.041)	(0.043)	(0.052)
WHZ	-0.191**	-0.137	-0.232	-0.334*
	(0.095)	(0.133)	(0.148)	(0.191)
Wasting	0.033	0.032	0.019	0.050
	(0.020)	(0.027)	(0.032)	(0.040)
Sample size	1,580	797	783	493

Note: Standard errors are in parentheses; * significant at the 10 percent level; ** significant at the 5 percent level.

Table 26: IPWRA estimates of the impact of PSNP public works participation on child nutritional status (2010)

	Child age			
	6–59 months			6–24 months
	All children	Girls	Boys	All children
HAZ	-0.017	-0.131	0.024	-0.146
	(0.098)	(0.134)	(0.139)	(0.199)
Stunting	0.001	0.027	-0.002	0.080
	(0.028)	(0.037)	(0.038)	(0.049)
WHZ	-0.052	-0.174	-0.006	-0.037
	(0.087)	(0.115)	(0.122)	(0.183)
Wasting	0.010	0.015	-0.002	0.017
	(0.019)	(0.024)	(0.027)	(0.036)
Sample size	1,728	873	855	491

Note: Standard errors are in parentheses.

Table 27: IPWRA estimates of the impact of PSNP public works participation on child nutritional status (2008)

	Child age			
	6–59 months			6–24 months
	All children	Girls	Boys	All children
HAZ	0.039	-0.044	0.214	0.148
	(0.126)	(0.166)	(0.177)	(0.231)
Stunting	0.020	0.041	-0.047	-0.049
	(0.038)	(0.047)	(0.050)	(0.055)
WHZ	0.074	0.131	0.038	-0.143
	(0.109)	(0.142)	(0.165)	(0.206)
Wasting	0.016	-0.002	0.026	0.076*
	(0.025)	(0.036)	(0.036)	(0.042)
Sample size	1,338	643	695	385

Note: Standard errors are in parentheses; * significant at the 10 percent level.

What is striking about Tables 25, 26, and 27 is the near complete absence of statistically significant results. There is no evidence that PSNP participation has any effect on chronic undernutrition as measured by HAZ or stunting. We found no effects in any survey round, nor when we disaggregate by age or sex. These non-results are robust to changes in model specification. We also tried estimating impact models using IV regressions (instrumenting the real level of payments) and running *woreda* fixed effects regressions in which we saturate the model with controls. These provided no evidence of impact, nor was there any evidence that the PSNP improves acute undernutrition as measured by WHZ or wasting. There are some isolated examples of PSNP participation leading to poorer acute nutrition outcomes, but these are few (3 out of 24 impact estimates) and only one is statistically significant at the 5 percent level.

6.4 Contextualizing the non-impacts

At household level, the PSNP has improved food security, as seen in Gilligan *et al.* (2009) and Berhane *et al.* (2015). Why, then, has it had no impact on children's nutritional status? While we cannot provide a definitive explanation, we can sketch some possible reasons.

We begin by examining associations between the PSNP, community-based nutrition (CBN) activities and children's nutritional status in these data.[25] We include CBN programs following a specific joint request from the government and PSNP donors, phasing them in gradually from 2008 to 2012. We document exposure to the CBN in these data and the associations between this and access to health extension workers, exposure to nutrition messages and one good nutrition practice. We look at

[25] CBN in Ethiopia has a number of components, including monthly community sessions to monitor and promote the growth of children aged two or younger, using ready-to-use therapeutic foods to treat severe acute undernutrition and counseling mothers on feeding and other childcare practices.

the overlap between access to these services, messages, practices and PSNP participation and compare this with information on children's diets. Finally, we look at associations between PSNP participation and our measures of children's nutritional status, conditioning on a number of characteristics, including participation in the CBN.

Table 28 shows the number of children in our sample by the year CBN was introduced into the *woreda* where they live.[26]

Table 28: Number of children in sample, by year of CBN introduction

	Survey year			
CBN introduced	**2008**	**2010**	**2012**	**All children**
2008	345	294	269	908
2009	–	693	595	2,086
2010	–	510	443	1,482
2011	–	–	247	884
2012	–	–	540	1,927
Woredas where CBN is not yet introduced	2,381	970	–	
Total	2,726	2,467	2,094	7,287

Although the PSNP surveys were not designed to assess CBN impact, the 2012 survey round did collect some information on mothers' contact with health extension workers and members of the Women's Development Army. It also asked questions about exposure to messages regarding foods for children under three and whether mothers boil drinking water.

Table 29 shows that across the full sample in 2012, only 33 percent of mothers had received a visited from a health extension worker the previous month. Just over 15 percent had been visited by a member of the Women's Development Army and only a quarter had received information about foods for young children. It is rare for households to boil water; less than 12 percent do so. Mothers living in *woredas* where the CBN had been recently introduced were more likely to have received a health extension worker visit in the previous month than those in *woredas* where the CBN had been introduced earlier.

[26] Note that this information is not available for all the *woredas* in our sample.

Table 29: Exposure to nutrition services and messages, by year of CBN introduction

	In the last month, % of households that have received:			
CBN introduced	**A health extension worker visit**	**A visit from the Women's Development Army**	**Information about foods for young children**	**Household boils drinking water before use**
2008	32.71	11.52	27.61	12.31
2009	35.53	21.66	33.67	13.18
2010	25.11	8.35	23.53	9.48
2011	24.18	13.11	10.25	8.91
2012	40.74	17.66	27.83	11.13
Total	32.98	15.49	26.49	11.25

Disaggregating these data by 2012, PSNP status reveals a similar picture (Table 30). Approximately one-third of mothers in 2012 PSNP households had received a visit from a health extension worker the previous month. Just over a quarter – 28 percent – had received information on foods for young children and only 11 percent said they boil drinking water. There is no meaningful difference if we disaggregate these data by type of PSNP benefits: public works or direct support.

Table 30: Exposure to nutrition services and messages, by PSNP beneficiary status (2012)

	In the last month, % of households that have received:			
PSNP beneficiary status in 2012	**A health extension worker visit**	**A visited from the Women's Development Army**	**Information about foods for young children**	**Household boils drinking water before use**
Not a beneficiary	33.4	14.5	28.5	11.2
PSNP beneficiary	33.3	18.2	26.0	11.4
Public works participant	33.5	18.8	26.3	11.6
Direct support recipient	37.4	16.8	28.0	11.2

Next, we examine data on the diets of 6–24-month-olds from the 2012 survey round. Recall that enumerators had a list of foods (such as eggs) or food groups (for example, foods made from beans, peas, lentils, nuts or seeds) and they asked mothers whether the child had consumed each item the day before during the day or at night. We are especially interested in the extent to which mothers feed foods other than porridges, *injera* and breast milk. Table 31 shows the basic results.

Table 31: Foods consumed by children aged 6–24 months the previous day (2012)

Region	Pulses	Dark, leafy vegetables or vitamin A-rich fruits	Other fruit or vegetables	Milk or other dairy products	Eggs	Meat, poultry or fish	Fats or oils
Tigray	22.5	14.7	8.5	12.4	20.9	3.9	17.1
Amhara	16.0	16.0	12.3	21.7	7.5	6.6	21.7
Amhara HVFB	15.5	7.7	4.5	13.5	3.9	5.8	8.4
Oromiya	7.5	14.5	13.7	48.6	9.8	3.5	15.7
SNNPR	4.0	30.5	12.0	37.5	5.5	2.5	15.5
All observations	11.5	17.3	10.7	30.7	9.1	4.1	15.3

Most striking about this data is how few children are getting animal source proteins such as eggs, meat, poultry or fish; protein or iron from pulses; or vitamin A or C from dark leafy vegetables or fruit. Across all children, 46 percent consumed none of the foods listed in Table 31 and only 11 percent consumed three or more. The most common food consumed is milk or other dairy products, with dairy consumed most frequently by children in Oromiya.

In Table 32, we use our IPWRA estimator to explore whether the consumption of these food items is associated with PSNP participation or the length of time respondents have been included in the CBN.

Table 32: Impact of PSNP public works participation on child dietary diversity (2012)

		Child consumed yesterday:				
	Number of different foods consumed	Pulses	Fruit or vegetables	Dairy	Eggs	Fats or oils
Household receives PSNP public works payments	-0.002	0.020	0.011	0.008	-0.001	-0.017
	(0.110)	(0.029)	(0.039)	(0.044)	(0.029)	(0.036)

Note: Standard errors are in parentheses; * significant at the 10 percent level; ** significant at the 5 percent level; sample size is 543.

The striking feature of these data is that participating in the PSNP has no impact on the quality of children's diets. There are no statistically significant links between the consumption of any of these foods and the household receiving PSNP benefits in 2012. Adjusting the covariates we used as control variables or defining PSNP participation in slightly different ways – for example, whether the household received public works or direct support payments – had no effect on these results.

6.5 Summary

Others (Gilligan *et al.* 2009; Berhane *et al.* 2015) have noted that the PSNP has successfully improved household food security. Given the poor status of child nutritional in the localities where the PSNP operates – 48 percent were stunted in 2012 – we asked whether the PSNP could improve child nutrition.

Using IPWRA estimators, we found no evidence that the PSNP reduces either chronic undernutrition (as measured with HAZ or stunting) or acute undernutrition (as measured with WHZ or wasting). While we cannot definitively say why this non-result occurs, we note that child diet quality remains poor. We found no evidence that the PSNP improves children's consumption of pulses, oils, fruit, vegetables, dairy or animal source proteins. Most mothers have not had contact with health extension workers and have received no information on good feeding practices. Water practices, captured by the likelihood that mothers boil drinking water, are poor.

Appendix A: Use of these findings

Early on in this project, we communicated with senior government officials and representatives of donor agencies responsible for the PSNP about this work. We subsequently arranged a workshop in Addis Ababa in May 2014 to report our preliminary findings. Some 60 persons attended. We chose this time carefully: we were confident that our basic results were sound and aware that government and donor efforts were under way to redesign the PSNP.

After the workshop, the Ethiopian government asked us to provide comment and input into the PSNP redesign to make it more nutrition-sensitive. The final program design, which was to be fielded in early January 2016, includes a range of measures that address the concerns we raise in this report, including much tighter linkages between the health and nutrition services and PSNP beneficiaries; and behavior change communication activities to encourage families to give preschool children foods that are rich in proteins and micronutrients and improve water and sanitation practices. We do not claim that our findings are solely responsible for these changes, but are confident that they provided evidence to suggest that these were important ideas to consider.

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Several studies have examined the impacts of Ethiopia's large-scale Productive Safety Net Programme (PSNP) in improving household food security. This study examines whether PSNP had additional impacts on children's schooling, labour and nutrition. PSNP combines public works employment for cash or cereals and direct transfers, and is aimed at enabling the rural poor facing chronic food insecurity to resist shocks, create assets and become food self-sufficient. The programme was implemented at scale in the four regions covered by this study. The study identified effects of participation in public works programme by comparing outcomes of PSNP beneficiaries and non-beneficiaries.

The impact of PSNP on children's schooling and labour outcomes vary across years. In the years when PSNP payments were low relative to the amount of work, PSNP participation lowered grade attainments. As PSNP payments increased relative to PSNP work requirements, these outcomes were reversed. Researchers found no evidence that the PSNP reduces chronic or acute undernutrition .

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