

**THE ROLE OF PUBLIC WORKS PROGRAM IN ENHANCING FOOD SECURITY:**

**THE MALAWI SOCIAL ACTION FUND**

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## ABSTRACT

The public works program of the Malawi Social Action Fund has been operational since the mid-1990s and aims to provide short-term labor-intensive activities to poor, able-bodied households for the purpose of enhancing their food security, mainly through increased access to farm inputs at the time of the planting period. The MASAF PWP currently targets 220,000 individuals per year, and coverage is scheduled to increase to 250,000 individuals per year for the next three years. The payment to each participant household is about \$16. Malawi's program differs from traditional PWP programs in paying relatively high wages over a short duration, and taking place during the productive time of year. These decisions are motivated by the explicit goal of increasing investment in agricultural inputs, rather than only smoothing or increasing household consumption.

We use a randomized controlled trial to test alternative versions of the PWP to address two research questions of broad interest. First, we examine the impact of the public works program (PWP) as an income promoting mechanism via its impact on agricultural productivity and labor markets through increased access to a variety of yield-improving inputs. Second, we investigate the implications of alternative payments schemes and estimate the extremely short run (one week) discount rates. The approach used is a randomized control-treatment design with four treatment groups and a control. The four treatment groups vary by the timing of the program in the year and the structure of program payments.

### 1. MOTIVATION AND CONTEXT

The objective of this research project is to study the large-scale public works component of the Malawi Social Action Fund (MASAF) and address two research questions of broad interest. First, we will examine the impact of the public works program (PWP) as an income promoting mechanism via its impact on agricultural productivity through increased access to yield-improving inputs and any impacts on labor markets. Second, the proposed design will allow us to understand the implications of alternative payments schemes.

The PWP under study here is a scaled-up national program in Malawi. This research project entails introducing alternative designs into the MASAF PWP in a randomized treatment-control approach to understand the implications of these different designs. The project explores two distinct aspects of the PWP. First, the study explores the role of timing of the PWP with respect to the seasonal income activities of households in Malawi. Duflo, Kremer and Robinson (2010), for example, emphasizes that the adoption of agricultural technologies by farm households depends on how the timing of the technology purchase coincides with cash income; in their study from Kenya this is harvest sales. An important aspect of the PWP program in Malawi, as we describe in detail below, is its implicit interaction with the large-scale national fertilizer subsidy program. We will test the extent to which the timing the PWP facilitates the purchase of productive inputs.

A second aspect of PWP design is the payment scheme itself -- if and how it interacts with constraints to borrowing and saving in the very short term. Extensive qualitative work done in preparation of the design of this project suggests that households treat the lump-sum payments of the PWP differently from income generated through short-term casual labor (day-labor activities referred to as "*ganyu*" in Malawi), often preferring the former to the latter. We will test this hypothesis directly by varying whether households get a lump-sum payment or split payments (three installments of pay structured about six days of work apart).

The aspects of the proposed study have important implications for the design of PWPs in general, as well as understanding their interactions with other government programs. In addition, the study will bring together two mostly distinct literatures on PWPs and financial constraints. In this section we describe the salient features of the

existing PWP in Malawi and the motivation behind it to provide context, followed by a brief review of the literature, and then a discussion of the policy relevance of this study.

#### MALAWI SOCIAL ACTION FUND PUBLIC WORKS PROGRAM

The MASAF PWP has been operational since the mid-1990s and aims to provide short-term labor-intensive activities to poor, able-bodied households for the purpose of enhancing their food security, mainly through increased access to farm inputs at the time of the planting period. This program is an important and interesting case to study for several reasons. First, the poverty alleviation motive of the PWP is made explicit via an explicit link to productive inputs (see, for example, Devereaux, 2001). The program is designed to be interlinked with Malawi's large-scale fertilizer input subsidy program (known as FISP) through the implementation of the PWP in the planting months of the main agricultural season when the FISP distribution also occurs. The premise behind this is that the PWP facilitates poor, credit-constrained households to be able to finance the purchase of productive inputs (fertilizer) conditional on the household's participation in the FISP. So, for such a program, the stated objective of improving food security is justified via the production side of the household activities since use of fertilizer should improve crop yields, and not via impact on current household consumption. The productivity link was an explicit decision implemented with the redesign of the program in 2004, when the wage was increased from MK 43 per day to MK 200 per day, and the timing of the program was changed to coincide with the agricultural planting season.<sup>1</sup> This shifted Malawi's program away from more traditional PWP design that entail program implementation during the "lean" season, timing motivated by food security principles which are similar to the MASAF program but aimed at consumption smoothing, not at improving household production. Those traditional PWPs aim to provide income at times of the year when consumption may be the lowest and when other forms of income generation are not as easily available. The productive link generally accrues as an indirect benefit, through the value of assets created or maintained.

The research design proposed here will study two main aspects of the PWPs in Malawi: first the straight up labor market consequences, both on labor markets as well as on within household labor decisions on farms). We want to understand how household and hired labor decisions are impacted, regardless of impact of yields or production. For example, it may be the case that households that participate in the program then recruit additional family and/or hired labor on their own farms. Third, public works may have spillover labor supply effects in the non-farm sector for households – in this context, this mostly refers to *ganyu* or non-farm enterprise activities (as opposed to regular wage/salary work). And, we can use methodology developed by Jacoby (1993)<sup>2</sup> to estimate shadow wages and measure labor productivity.

The second aspect is the interaction of the PWP with the productive aspects of agricultural, in particular technology adoption vis a vis fertilizer, seed and other inputs. Fertilizer has been shown to have large returns across a variety of developing countries, both in field trials conducted by various country agricultural research

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<sup>1</sup> An alternative approach would be to increase the subsidy on fertilizer (possibly to 100%, making it free). However, the public works program supports multiple goals, including community asset building and promotion of gender equality, which can be pursued alongside increased fertilizer usage through the public works program. Further, the work requirement can be used to target the PWP to households with fewer outside opportunities, though targeting is not accomplished by the current PWP wage. See for example Chirwa et al. (2004), Devereux and Macauslan (2006), and DFID (2006).

<sup>2</sup> Jacoby, Hanan (1993) "Shadow Wages and Peasant Family Labour Supply: An Econometric Application to the Peruvian Sierra." *Review of Economic Studies* 60(4): 903-21,

institutes. For example, Duflo, Kremer and Robinson (2009)<sup>3</sup> show high returns to top dressing fertilizer on maize in Kenya, between 52% and 85%. Similar estimates come from the experiments conducted by the Kenya Agricultural Research Institute. Estimates from Malawi (Ricker-Gilbert and Jayne (2010)<sup>4</sup> show significantly large high static and dynamic returns to fertilizer. The government fertilizer subsidy program in Malawi (as in other developing countries, presumably because it is seen as cost-effective at impacting production/productivity) is large and so understanding how the public works program will interact with other input programs is important. For example, the budget for the Agricultural Input Subsidy Program in Malawi has grown in importance over time, from US \$51 million in 2005-6 to US \$95 million 2007/8 and US \$ 252 million in 2008/9 (GoM budget statistics<sup>5</sup>).

Though not explicitly designed around this, the program may also interact with existing seed distribution programs. The research will therefore also understand whether the design of the PWP impacts adoption of higher yielding crop varieties like hybrid; these improved seed are a part of the Government of Malawi's agricultural agenda. We will also consider other aspects of inputs and technology like water and soil management technologies, good crop practices (like line seeding, proper drying). The IHS3 questionnaire has a minimal set of self-reported questions on these topics. From our previous experiences in Malawi and elsewhere in Africa, these are not used by a wide number of farmers, however, so detecting effects on these practices may be difficult. In addition, fertilizer and seed are the two most important inputs in agricultural production in economies like Malawi. For example, Suri (2011)<sup>6</sup> documents in detail the various costs for Kenyan farmers through their production cycle, most of which are seed, fertilizer, and labor costs. Most agriculture is rain-fed with little irrigation and land preparation costs are a small part of total costs. In addition, the vast majority of the labor on small-holder farms in Malawi is family labor: fewer than 20% of households hire any labor for the two major farm activities, maize or tobacco cultivation. Fertilizer is an important input and a large expense for farmers. The MASAF PWP currently targets 220,000 individuals per year, and coverage is scheduled to increase to 250,000 individuals per year for the next three years. The payment to each participant household is about \$16.

The PWP wages are paid to households in a lump-sum payment generally with a slight delay after the end of the 12-day work period. As noted, the rationale for the PWP has been to help overcome any credit constraints in financing productive inputs. The program is therefore designed to allow participants to receive an injection of cash at a point in time to be able to effectively finance purchases on productive inputs. This injection of cash is meant to overcome constraints to short-term saving and borrowing that would otherwise prevent households from investing in these inputs.

Given the timing of the program and the budget, the program has been designed to have a combination of a reasonably high daily wage but a short duration. This design intentionally limits the high opportunity costs in terms

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<sup>3</sup> Duflo, E., M. Kremer and J. Robinson (2009) "Nudging Farmers to Use Fertilizer: Theory and Experimental Evidence from Kenya." NBER WP15131.

<sup>4</sup> Ricker-Gilbert, J. and Jayne T.S. (2010) "What are the Dynamic Effects of Fertilizer Subsidies on Household Well-being? Evidence from Malawi." paper presented at the African Association of Agricultural Economists Conference, South Africa September 2010.

<sup>5</sup> See also Dorward, A. and E. Chirwa (2011) "The Malawi Agricultural Input Subsidy Programme : 2005-6 to 2008-9", forthcoming, International Journal of Agricultural Sustainability 9(1).

<sup>6</sup> Suri, Tavneet (2011) "Selection and Comparative Advantage in Technology Adoption." *Econometrica* 79(1): 159–209.

of foregone income or work on one's own farm, which can be high during the planting season. However, that said, a relatively high wage rate increases the need to ration the number of jobs available for a given budget, resulting in lower coverage and lower aggregate poverty impact. There is generally queuing for participating in the PWP (as described later in this proposal). A final note is that the current scale of the PWP is quite small relative to the needs to the target population.

Assessing the presence of the productive role of the PWP as currently designed has important implications for (i) the design of future social protection interventions in Malawi, as the results could feed back into the design of the next phase (ii) more generally, for improving our understanding about the mechanisms through which public works operate and their inter-linkage with complementary activities. There is scant empirical evidence that maps the relative effectiveness of alternative designs of PWPs in achieving different objectives.

DFID's 2006 *Review of Social Protection Instruments in Malawi* notes that "Unfortunately, there is little cross-country evidence that public works projects can produce high quality, useful, pro-poor and durable assets that contribute to sustainable poverty reduction" (p. 7). In Malawi specifically, "there is little evidence of a positive economic or livelihoods impact arising as the result of public works assets, (or for that matter evidence to the contrary), since data is not gathered on this aspect of PWPs, despite this being an intrinsic component of programme objectives" (McCord 2005, p. 8).

The alternative design components of this project mimic more traditional PWPs in the sense of more frequent payments and being implemented in the lean season. Using the MASAF as the backdrop to the RCT proposed here allows us to test the implications of the specifics of the Malawi program as compared to more traditional programs. In addition, the analysis proposed below allows us to tie this effectiveness back to household-level decisions and constraints vis a vis saving and borrowing constraints, investment, and consumption smoothing.

#### RELEVANT LITERATURE REVIEW

PWPs are an important tool for social protection (Grosh et al., 2008). Rising commodity and fuel prices and the recent global financial crisis have stimulated interest in the usage and effectiveness of PWPs in the developed world and in low-income countries. In sub-Saharan Africa, PWPs have played a substantial role in promoting social welfare and have ranged widely in objective, structure, and size. Although data on the scale of PWPs in sub-Saharan Africa is scarce, particularly for projects designed to address systemic poverty or the recent financial crisis, McCord and Slater (2009) identified 167 PWPs across 29 different countries in the region. Despite the pervasiveness of PWPs in low-income countries and the extensive descriptive and theoretical literature on them, comparatively little research attention has been paid to the key design features of project timing and payment distribution, both of which may significantly alter program impacts.

#### PUBLIC WORKS DESIGN

PWPs, also referred to as workfare programs, require participants to work in order to receive a benefit (either cash or in-kind). The target population for such programs is the able-bodied poor. There are two underlying theoretical motivations for the work requirement (Besley and Coate, 1992): a screening argument, such that only the poor will self-select into the program, and a deterrent argument, such that the programs may discourage dependency. The self-targeting (screening) feature makes these programs popular in LDCs where governments typically lack the information and capacity to systematically screen participants based on a targeting rule or criterion. The self-targeting mechanism is not perfect; significant numbers of non-poor may decide to participate (Asefa and Teklu, 1999), and the work requirement of PWPs may steer benefits toward the poor who spend the most (Gilligan and Hoddinott, 2007).

PWPs are very heterogeneous; program design varies by country and region according to the objectives of the program (del Ninno, Subbarao and Milazzo, 2009 and Mc Cord and Slater, 2009). Past research on workfare programs has highlighted the importance of design features for maximizing potential gains and has emphasized the key roles of the wage rate and labor intensity (Ravallion, 1991, 1999 and Subbarao, 2003).

Characterized broadly, PWPs can aim to achieve different objectives. First, they offer social protection through short-term labor opportunities. In this case, the expected net wage gain is the program wage minus the foregone income.<sup>7</sup> Whether income gains are used to finance consumption, savings or investment is generally not documented. These programs have elements of risk reduction and stabilization via consumption smoothing in response to individual or aggregate shocks (e.g. unemployment or income shocks due to financial or macro-economic crises, or weather-related droughts/floods and other causes of crop losses). Programs with a consumption-smoothing objective are generally short term and predominate in Sub-Saharan Africa. Alternatively, a PWP can serve as on-going employment/income insurance. These are programs that provide income floors or guarantees. Examples include the ESG in Maharashtra, India, the national NREGA scheme in (Ravallion, Datt, and Chaudhuri, 1993) and to a smaller extent the PNSP in Ethiopia. The employment guarantee is achieved insofar as the program is not rationed. Two expected benefits from insurance come from (i) reducing the use of inefficient smoothing methods (Chetty and Looney 2006) and (ii) promoting portfolio diversification into higher risk and higher return activities as the downside income variability is contained.

#### PWP AND SAVINGS CONSTRAINTS

The impact of PWP does not depend only on the total income offered by the program; the payment structure itself can influence impact. Because financial intermediation is relatively inaccessible for many poor residents of low-income countries, the savings and investment decisions of these poor households may be quite different than that exhibited by households in countries with more developed financial markets. Researchers have approached savings and investment by poor households from various perspectives. Goldstein and Udry (2008) establish a link between political power and the propensity to invest among rural farmers in Ghana. Others document that the poor may forgo small, profitable investments in agriculture (Duflo, Kremer, and Robinson 2008) when they procrastinate in making these investments, or in small enterprise (de Mel, McKenzie, and Woodruff 2008), because they may face high costs of saving money to purchase inputs. Duflo, Kremer, and Robinson (2008) also show that the timing of investment availability affects investment decisions. Timing of investment decisions may be particularly important for rural farmers, whose cash income, and therefore savings in-flows, fluctuate throughout the year. Other studies corroborate this sensitivity to timing by documenting the high interest rates that the poor may be willing to pay for short-term financial capital (Aleem, 1990, and Karlan and Zinman, 2010). Another obstacle to accumulating lump sums of money from smaller payouts may be the demands from others in the social network. In Malawi, Brune et al. (2011) find increased use of agricultural inputs and increased household consumption for tobacco farmers who were offered “commitment” savings accounts that restrict access to cash and may provide a credible excuse for refusing requests for money from others in the social network.

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<sup>7</sup> Estimates of the opportunity cost of participation in a PWP suggest that it could be substantial (Datt and Ravallion, 1994, Jalan and Ravallion, 1999, Galasso and Ravallion, 2005, Wodon and Zaman, 2010). If the main objective is to transfer income gains to the poor, it is unlikely that workfare programs are more cost effective in reducing poverty than un-targeted transfers. Murgai and Ravallion (2005) show that despite the cost of leakage to the non-poor, an untargeted transfer would have a greater impact of poverty as it would save on the extra cost of foregone income for participants as well as non-wage costs in implementing the workfare program.

Traditional economic theory explains low savings and high borrowing among the rural poor in terms of minimum subsistence constraints (the desire not to starve overwhelms concerns about capital costs), or in terms of strong preferences for present consumption over future consumption. However, empirical evidence does not fully support these explanations. The explanatory power of minimum subsistence constraints is undermined by evidence that the poor spend a significant portion of their income on non-necessities (Banerjee and Duflo, 2007). With respect to high discount behavior, such behavior coexists with a strong desire for commitments, as evidenced by participation in ROSCAs and demand for restricted savings accounts (Ashraf, Karlan, Yin, 2006).

Addressing these inconsistencies, a growing literature in behavioral economics has challenged the assumptions of the standard model and has turned to models that assume present-biased time preferences, or hyperbolic time discount functions. Under such assumptions, low savings are explained by issues of self-control; that is, competing preferences dictate different actions at different times (Ainslie, 1992, Laibson, 1996, Frederick, Loewenstein, and O'Donoghue, 2001, Ashraf, Karlan, and Yin, 2006). Typically, these hyperbolic discount rates operate over intervals of time measuring a month, a year, or longer. Our own qualitative work in central Malawi confirms that rural households perceive serious obstacles to saving money. Many people opt to have wages withheld for a week or more from casual labor activities in the private market, because money received daily may otherwise be used on temptation goods despite the intention to save it for a larger purchase. Our work has also show that households state a preference for in-kind transfers rather than cash because, as they describe it, they "have difficulty keeping the cash". The problems described relate to very short-term savings, but the desire for commitment matches the behavior predicted by models with hyperbolic preferences.

In the context of PWP payments, this suggests that the timing of the payment may have important implications for the way households prepare and are able to execute a desired plan of action with respect to consumption and investment decisions. In this project, we plan to vary the timing of the PWP payments randomly to test for evidence of the presence of obstacles to savings, including potential self-control problems. The interaction of the timing of the payment for the work with the timing of the work itself (the calendar months when the program operates) will allow us to test the implications of these findings in terms of consumption and savings allocations as well as consumption and investment decisions.

Documenting high discount rates or other obstacles to saving money even over very short time periods is of obvious academic interest, but it has practical implications as well. For example, cash transfer programs might want to consider different payment schedules at different times of the year. Also, if accumulating money from different sources even over a short period of time is a serious challenge, then the MASAF program's narrow targeting with large transfers to a small number of people may be justified as a means of helping beneficiaries invest in productive assets. Additionally, while there are a number of specialized savings products designed for Malawi and other developing countries, those products are intended to help customers save over months, seasons, or years. If people experience obstacles to saving money over very short horizons, different products are likely to be appropriate (see, for example, Duflo, Kremer and Robinson, 2010, Dupas and Robinson, 2010, Mullainathan and Shafir, 2010).

The PWP program in Malawi also include a small pilot of savings and mobilization promotion (called COMSIP), targeted mainly to former beneficiaries of the PWP, and designed along the lines of the popular programs targeting the ultra-poor developed by BRAC. The objective of COMSIP is to provide technical assistance and outreach to promote savings of public works earnings to enable the poor to "graduate" from public works and increase the sustainability of the PWP program. The small scope of the COMSIP pilot, combined with the limited coverage of the PWP, does not allow us to test the value added to this pilot. But, to the extent possible, we will

document descriptively the income and savings trajectories of COMSIP participants. This should provide stylized facts on the pilot to be compared to other existing pilots of other livelihood programs combined with PWP.

#### INNOVATION AND POLICY RELEVANCE OF THE EVALUATION

The proposed research design has two main innovative research contributions. First, evidence from the study on short term credit and liquidity constraints within *very* short periods of time has important implications for the design of cash transfer programs that are increasingly popular tools for social protection (on the latter point, see for example World Bank, 2012, and Grosh et al., 2008). It also has implications for broader issues of financial access and the need to design basic savings and loan services that allow poor households to overcome liquidity constraints in the short term. The design here will allow us to study the role of very short term liquidity constraints. There is extremely limited empirical evidence on discounting, impatience, or credit constraints in the ‘very short term’ among low-income populations. A number of researchers do try to empirically estimate discount rates, and though the estimates are imprecise with wide confidence bands, those for Africa are extremely high and would indeed be meaningful over even short periods of time<sup>8</sup>.

This idea that households may face constraints over the very short term was motivated by extensive focus group discussions that we conducted in November 2010, and January, February and May 2011. The results from all these focus groups really helped define the research question on the timing of payments and that being paid a lump sum at the end of working leads to dramatic differences in how money is used. People prefer lump-sum arrangements for private *ganyu* as well as for MASAF payments, saying that lump sum of money enabled them to “be serious” about the money, and that being paid daily “doesn’t help someone achieve what he wants.” Instead, when people are paid daily, they are “tempted to use it” for other purposes. Temptations include buying small amounts of salt or soap; buying medicine for a child who has a fever; giving money to children for biscuits or treats; buying beer; going to the video shop to watch movies; and making a contribution at a funeral. If people are paid day-by-day and have cash in hand, then “problems emerge” and they spend the money on those new problems (such as a sick child, a friend’s funeral, or a lack of soap at home) rather than keeping it for the larger purchase they had intended. People describe retaining money even from one day to the next as “saving,” and they say that it is hard to save money, even for a very short period of time. These themes echo the challenges of short-term money management in light of low and uncertain incomes so well portrayed in the book *Portfolios of the Poor*.<sup>9</sup>

Much as the results from the focus groups are interesting, they do not provide quantitative, statistical robust, results. We hope to produce new and high-quality evidence to start to fill this vacuum.

The second contribution is towards understanding how best to design PWP programs and their timing in economies that are predominantly agricultural. There is not good evidence on the optimal design of PWP programs in terms of timing, especially relative to activities in the agricultural cycle, although certainly well founded theoretical propositions exist. Such evidence would need carefully designed studies with high-frequency panel

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<sup>8</sup> Chabris et al (2008) Individual Laboratory-Measured Discount Rates Predict Field Behavior, NBER WP 14270. Gine Xavier, Jessica Goldberg, Dan Silverman, and Dean Yang. “Revising Commitments: Time Preference and Time-Inconsistency in the Field.” Working Paper. Simone Schaner, “**Intrahousehold Preference Heterogeneity, Commitment, and Strategic Savings: Theory and Evidence from Kenya**”, Working Paper.

<sup>9</sup> *Portfolios of the Poor: How the World’s Poor live on \$2 a Day*. Daryl Collins, Jonathan Morduch, Stuart Rutheford, and Orlanda Ruthven. Princeton University Press, 2009.



data. To what extent does timing shift the impact of public works from a consumption smoothing role to being an investment opportunity for the poor?

We believe that the investment rationale to the public works program in Malawi is novel. Our research study replicates the traditional design of public works as short-term safety nets during the lean season, but also provides a novel investment rationale for public works for food security. Shedding light on whether this investment link exists and, if so, quantifying its magnitude, is important for the general debate on the scope for social protection programs in low-income countries. The investment link is interesting in light of the evidence on credit constraints: if people are credit constrained and their income is highly seasonal, we want to give them money at the time they are most constrained. The alleviation of credit constraints, even for small amounts of capital, might have high marginal returns if provided at the time of the year when they are most constrained. As such, the returns to capital of seemingly low transfers (\$16) at the right time of year might be considerably larger than expected.

## 2. RESEARCH QUESTIONS AND SAMPLING

The village randomization design used in this project will allow us address two sets of questions related to Malawi's public employment program. First, it will produce experimental estimates of the impact of the program on its beneficiaries. It will assess the importance of several prominent but atypical features of Malawi's PWP compared to programs in other countries, including the program's timing and payment structure. Second, it will test several hypotheses related to investment decisions and consumption smoothing, and explore their impact on the effectiveness of the program. In addition to addressing these questions, we will also provide experimental estimates of the impact of within-village targeting by GVH who select the participating households. We describe each of these research questions in more detail below.

**1. Testing the impact of the current design of the PWP: Comparing Group 0 to Group 1.** *What is the impact of the status-quo program on beneficiaries' labor markets, allocations of labor within agricultural households, use of agricultural inputs and resulting agricultural yields, on food security during the planting portion of the main agricultural season, and on other indicators of household wellbeing? We can answer this by comparing Group 0 to Group 1 outcomes. The outcomes of interest include the use of family and hired labor, investment in fertilizer, seed and other productive agricultural inputs assets; current cash income, consumption of temptation goods; and consumption of maize and other foods; investment in education of children and expenditure on school fees.*

**2. Testing the productive input link of the program vs. the potential consumption smoothing or buffer role: Comparing (Groups 1 and 2) to (Groups 3 and 4).** *Would implementing the program at a different time of year change its effect on use of productive inputs and hired or family labor or on consumption smoothing? If providing employment in time to purchase fertilizer is an important characteristic of the MASAF program, then we would expect to see a higher probability of purchasing fertilizer and higher levels of fertilizer use among Groups 1 and 2 than among Groups 3 and 4. On the other hand, we will compare the groups' consumption of maize and other foods during the lean season, in order to test whether employment during the lean season would be a more effective safety net than the status quo timing. As discussed previously, one down side of offering the public sector employment program during the planting season is that the opportunity cost of time is higher than during the lean season. We can compare total on-farm and off-farm labor supply and the levels of hired labor between Groups 1 and 2 and Groups 3 and 4 in order to understand this trade off and see whether MASAF work during the productive season crowds out higher-paid employment and has opportunity costs (forgone income), and leads to people taking less lucrative work during the lean season.*

**3. Testing short-term constraints to savings and credit: Comparing (Groups 1 and 3) to (Groups 2 and 4).** *Do households face obstacles to saving income or getting credit over very short time horizons? Is it difficult for households to accumulate enough money to purchase productive inputs? We will look at two types of outcomes: investments, especially those that require a minimum scale, and consumption, especially of temptation goods. The market price of fertilizer in Malawi is approximately MK 5000 for a 50 kg bag. The national fertilizer subsidy*

program provides roughly half of households in the country with coupons that allow two bags of fertilizer to be purchased for MK 500 each. Because households face high transaction costs when redeeming their fertilizer coupons, including transportation costs, long wait times, and inflexibility in the days on which fertilizer can be purchased at the government shops, it is substantially more efficient to purchase both bags of subsidized fertilizer at once, for MK 1000 plus transportation costs (which are likely to range between MK 200 and MK 500). While the lump sum of MK 2400 more than covers the cost of purchasing two bags of subsidized fertilizer, a single incremental payment of MK 800 does not. We will specifically look to see whether lump sum payments leads to a higher probability of purchasing fertilizer than split payments for those participants who work in December; we will be comparing fertilizer use between Group 1 and Group 2.

**4. Testing interaction effects between the timing of the program and the schedule of payments: Comparing Group 3 to Group 4.** *Is there seasonal variation in the impact of savings constraints? Are obstacles to savings more important when households have the opportunity to purchase lumpy investment goods? Does temptation to spend on luxury goods affect households' ability to smooth consumption during the lean season?* While a lump sum payment may facilitate investment in a lumpy input for December employment, split payments may help smooth consumption during the lean season. People who receive a large amount of money in December are likely to put some of it towards the purchase of fertilizer and/or seed, but there is not a similarly-profitable investment to be made in February. A large lump sum in February may be used for staples as well as temptation goods; divided payments can act as a form of commitment savings that will lead to smoother consumption of staples if people otherwise have high temptation to spend or high discount rates even over very short periods of time. We will compare Groups 3 and 4 to test whether people paid in a lump sum are more likely to spend on temptation goods and whether they spend a higher share of their MASAF wages on temptation goods than those who are paid in three equal payments for work done in February.

### 3. HOUSEHOLD RANDOMIZATION

The second level of randomization is at the household level. The reason for adding this layer of randomization is primarily due to power issues. The highly decentralized MASAF program charges GVH with choosing a small number of households to be offered employment through the PWP. MASAF participants are not randomly selected, but instead entirely chosen by the GVH and Village Development Committees. The program has a 15% coverage rate. As discussed earlier, we will be using the IHS3 survey as a baseline for this study. By chance, then, it is likely that one or two of the IHS3 households in each sampled village will be among those chosen for the PWP.

We will collect the list of selected households from GVH, who will assign households without knowing that their villages may be designated for an alternate program design. To increase the sample size for sufficient power for the experimental design at the village level, we will randomly choose 10 households from the 16 that are already part of the IHS3 sample to be included in the program.<sup>10</sup>

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<sup>10</sup> We are not proposing to stratify among the 10 selected, but we do expect to get sufficient samples of specific households of interest, such as female-headed, relatively larger land holders, etc.

In each study village, the complete list of participants in the PWP will be the union of the GVH-selected beneficiaries and additional IHS3 households randomly selected. The participants, regardless of which group they are from, will not be differentiated in the PWP with respect to the work they do and the village-level timing of employment and payments.

The sub-set of households which will be analyzed will be those in the IHS3 sample. Since some of the households that are randomly assigned to the within-village control group (non-participants) will be chosen by the GVH and therefore allowed to participate, the non-participating households in the IHS3 sample are not representative of the village. However, there should be balance between randomly selected households who were not on the GVH list and randomly not-selected households.

The need to increase MASAF participation among IHS3 respondents (due to power issues) creates an opportunity to address additional questions related to targeting of the program and heterogeneity in its effects. As recently as September 2010, the Government of Malawi's Synthesis Report on Social Support Programmes noted that "none of the PWPs have been evaluated for targeting effectiveness. The MASAF short-term PWP is usually over-subscribed and experiences difficulties with beneficiary screening due to the high wage rate" (Malawi National Social Support Programme Formulation, p. 3). The Annex includes additional discussion about the household randomization within villages.

Household randomization will therefore allow us to additionally test the following:

**1. Testing targeting of the program: Comparing GVH-selected participants to randomly selected participants.** We will do this in terms of their observable characteristics.

**2. Heterogeneous effects: interaction of treatment group with baseline characteristics.** *Are there predictable differences in the impact of the MASAF program that are correlated with observable characteristics of participants? Can observable characteristics be used to develop selection criteria that would lead to larger aggregate impacts of the program? While these baseline characteristics are not randomly assigned, previous literature suggests some obvious dimensions of heterogeneity to explore: absolute wealth (or asset index), level of consumption during the previous hungry season, household size to see if households with higher marginal utility of consumption use their wages differently than those with lower marginal utility of consumption; relative wealth, and degree of social connectedness, in order to test whether wealthier individuals or those with more relatives are more exposed to sharing norms.*

#### 4. SAMPLE AND DATA

An innovation of this research design is to build a large-scale randomized controlled trial (RCT) on the nationally representative IHS3 sample. The IHS3 was implemented by the National Statistics Office and supported by the LSMS Integrated Surveys on Agriculture project. The survey includes 12,288 households in 768 enumeration areas and has extensive household and agricultural modules. Using the IHS3 as a baseline for this project provides much richer data than would otherwise be feasible. Additionally, this project is designed to be nationally representative, a contrast to typical RCTs that have narrow geographic scope. The survey questionnaire designed will cover all important aspects of the proposed research contributions, including extensive data on labor market participation for all household members (on farm as well as off farm), detailed labor use on households farms (broken out by

hired (separately for casual and contracted) and non-hired) and on a variety of productive inputs use, like fertilizer, seed and other agricultural inputs mentioned above.

#### SAMPLE SIZE AND POWER CALCULATIONS

Our analytic sample will consist of the 16 households randomly selected for inclusion in the IHS3 survey. The IHS3 coverage fixes our cluster size, since we will use that survey as the baseline for our study.

#### SAMPLING CLUSTERS – STRATIFICATION AND INFERENCE

All of Malawi's 28 districts are included in the PWP program. We will randomly choose 10 districts for this study, stratifying by the country's three geographic regions. Within selected districts, we will abide by the program's decentralized structure by taking a list of participating villages from the District Council and Traditional Authorities, who target geographic areas based on Vulnerability Assessment Mapping (VAM) criteria. We will randomly allocate those villages among the four treatment groups and the control group described in the previous section.

#### SAMPLING INDIVIDUALS WITHIN VILLAGES

Our power calculations suggest that to detect an effect size of 0.4 standard deviations with 80 percent power, we need 50 villages per treatment group and 50 villages in the control. However, a 0.4 standard deviation intent-to-treat effect with MASAF's 15% coverage rate would require an unfeasibly large (2.67 standard deviation) average treatment effect. We believe that a 0.6 standard deviation average treatment effect is feasible. To get the required 0.4 standard deviation ITT effect from a 0.6 standard deviation ATT effect requires increasing participation to 0.67 percent.

After sampling villages, we will use the household-level randomization described above to increase the coverage rate of the MASAF program. As described above, this will entail augmenting the GVH-selected participants with additional households randomly selected from among IHS3 respondents. This additional coverage of the MASAF program should give us sufficient power.

The analytic sample for this project will therefore consist of the 16 IHS3 households in each selected village. The final sample will consist of the 16 IHS3 households in each of 200 treatment villages (four treatment groups of 50 villages each), to make a total of 3,200 households in treatment villages. In addition, we will have 50 control villages, adding another 800 households, for a total sample size of 4,000 households.

#### DATA COLLECTION

As explained, the IHS3 will serve as the baseline survey for this project. We will collect interim data on consumption expenditures and labor supply three times during the implementation, and we will conduct follow-up interviews in conjunction with the planned IHS3 panel follow-up in 2013 (which is a subsample of about 3,200 households of the original 12,000).

The interim surveys will repeat selected modules from the IHS3, albeit with some specific modifications. Specifically, the consumption expenditures module will be revised with respect to individual (as opposed to household) consumption patterns for specific goods (especially temptation items), as well as collecting more detailed information about informal transfers and loans than in the IHS3 questionnaire.

As we are interested in detecting very short-term changes in consumption patterns, we will require high-frequency data collection, on a tightly controlled schedule. The same holds for the labor supply data and households hiring and use of family labor, given we expect to see differential patterns on labor supply that correspond to the various

timings of the treatment groups. The data collection will therefore be closely aligned with the timing of the program. The overall project timeline is outlined in Table 4.1.

**Table 4.1 Timeline of the evaluation**

	<b>2010</b>	<b>2012</b>		<b>2013</b>			
	<b>IHS3</b>	<b>Nov</b>	<b>Dec</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>IHS4</b>
<b>Survey</b>	Sample villages interviewed in Dec 2010/ March 2011	1 <sup>st</sup> follow-up survey		2 <sup>nd</sup> follow-up survey		3 <sup>rd</sup> follow-up survey	Re-interview sampled villages
<b>Program activities</b>		Work activities for Groups 1 and 2 begin	Work activities for Groups 1 and 2 conclude	Work activities for Groups 3 and 4 begin	Work activities for Groups 3 and 4 conclude		

## 5. INTERVENTION - ANALYTIC DESIGN

Before we discuss the planned design of the RCT, we first describe the current implementation of the MASAF PWP. We then describe how the RCT study will be built into the MASAF program.

### THE CURRENT DESIGN OF THE MASAF PUBLIC WORKS PROGRAM

#### TARGETING, COVERAGE, AND IMPLEMENTATION ARRANGEMENTS

The MASAF program covers all districts of Malawi with a two-stage targeting approach. The amount of funds given to a district is proportional to districts' population and to the poverty rates as well as measures of vulnerability. District Consultative Forums, composed of district officials, Traditional Authority (TA) leaders in the district, and Members of Parliament, target a sub-set of extension planning areas (EPAs) in the district based on poverty and vulnerability criteria. Funds are then allocated to TAs, whose leaders each who oversee 20-30 Group Village headmen (GVHs), within the selected EPAs. TAs then allocate funds to a subset of selected GVHs who each oversee between 3-10 villages. The GVH determines how many households will participate in each village based on available funding; the GVH then works with the Village Development committee in each of the villages to select participating households.

As mentioned above, the program currently targets 220,000 individuals per year, and coverage is scheduled to increase to 250,000 individuals per year for the next three years. About 22% of the population resides in communities where the MASAF PWP is operating (authors' calculations from the 2010/2011 IHS-3, unpublished). With substantial rationing, there is no guarantee built in the program for interested households, hence the PWP is not currently designed to serve as an insurance mechanism. About 10% of households in participating villages had worked for the PWP in 2009 (authors' calculations from the 2010/2011 IHS-3, unpublished). While the program is perceived to be better targeted than other safety net interventions in the country, there are still substantial targeting errors, with one third of the beneficiaries originating from non-poor households (World Bank and Government of Malawi, 2007).

#### WAGE RATE AND DURATION

Participants are expected to comply for 12 full days of work mostly on construction and maintenance of local infrastructure. The wage rate is set at MK200/day (US\$1.3/day for 12 days, about US\$16 in total). This wage rate is substantially higher than the government's minimum wage of MK 170/day for casual labor in the rural sector.<sup>11</sup> For average rural households, the MASAF payment is very large compared to monthly cash expenditures: it is 15 percent greater than average monthly cash outlays for food (authors' calculations from IHS-2).

#### TIMING OF THE PWP AND LINKAGE WITH FERTILIZER SUBSIDY

The PWP is implemented from the month of October to the month of December/January each year. The Government of Malawi strategy explicitly links the MASAF PWP to the fertilizer input subsidy program (FISP). This timing was therefore designed to align with the agricultural season and achieve better adoption of fertilizer and take up of the FISP. The timing of the PWP therefore de facto links the PWP to the fertilizer subsidy program in Malawi (and more generally to the purchase of agricultural inputs). As discussed earlier, the food security objective of the PWP is therefore aimed at enabling production, rather than providing consumption smoothing in the lean season.

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<sup>11</sup> See Goldberg (2010) for a detailed discussion of the casual or day-labor market in Malawi .

The wage rate was increased in the 3<sup>rd</sup> round of the MASAF loan, again with the expectation that the higher wage would allow participants to use some of the income transfer to help purchase at least one bag of subsidized fertilizer. A beneficiary assessment of the MASAF 3 suggested that earnings from the PWP were mainly used to purchase fertilizers (68%), maize (25%, on average sufficient to cover food needs for two months) and seeds (7%) (Jimmat Development Consultants, 2008). Earnings allocated to other consumption items were reported to be very low. This is in contrast with the findings in Chirwa et al. (2004), which studied the pre-2004 program that was not linked to the input subsidy scheme and concluded that PWP wages were spent primarily on consumption goods.

The role of the timing of the PWP may matter in so much as there is seasonality in consumption patterns, income sources, and poverty in Malawi. Not surprisingly, such seasonality is high, reflecting the high dependence on small-holder farming. The average per capita calorie intake is highest in the month following the harvest (May-August) for the long-rainy season; per capita calorie reaches its lowest levels in the 'lean' season, months before harvest when households are more likely to be buying maize at their highest prices of the year (World Bank and the Government of Malawi, 2007). Hours in farming among adults in Malawi peaks from November to January: weekly farm hours per person are almost 50% higher in these months than at other times of the year (Wodon and Beegle, 2006). Non-farm cash income sources are much less active in the lean months of February and March. Drawing on the most recent IHS3 data (unpublished), among all household non-farm enterprises which were active in the past 12 months, 13% have "high sales" activity in February and March, compared to 32% of firms on average in other months.

## RESEARCH DESIGN

The design of this research project is focused on varying timing dimensions of the program. We will use cross-cutting randomization to test an alternative timing of the program months and the payment schedule as follows:

1. Alternative timing of program months: provide employment in February (as opposed to December), a time of year with lower opportunity cost of time and higher marginal utility of consumption.
2. Alternative payment schedule: spread wages across three equal payments of MK 800, to be made after the first six days of work are complete and before the second six days begin; immediately after the 12th day of work is complete; and one week after finishing the program (as opposed to a lump sum being paid some weeks after the work is completed). This alternate payment schedule may inhibit ability to accumulate money to purchase fertilizer in December, but enhance consumption smoothing and reduce spending on temptation goods in February.

This RCT will uniquely take advantage of the recent national household survey which will serve as baseline data. The third Integrated Household Survey (IHS3), fielded from March 2010 to March 2011, surveyed 12,288 households in 768 enumeration areas and collects extensive household and agricultural data.

The randomization will take place at two levels: at the village level and then at the household level. We describe each and the reasoning for requiring each of these levels next.

## VILLAGE RANDOMIZATION

In the first level, villages will be assigned to one of five groups (four treatment groups and a control). The first of these groups is a pure control group (Group 0) in which villages do not participate in the public sector employment program in the 2011-2012 season. Groups 1 through 4 will be treatment groups that vary in terms of the timing of the program itself and the schedule of wages payments as illustrated in Table 5.1 below.



Table 5.1: Study design and village assignment

	<b>December</b>	<b>February</b>
<b>No MASAF</b>	Group 0	
<b>MASAF with lump sum payment</b>	Group 1	Group 3
<b>MASAF with split payment</b>	Group 2	Group 4

Villages in Group 0 will not be eligible for the MASAF program in the 2011-2012 season. Villages in Groups 1 and 2 will work in December, the status quo program timing. Those in Group 1 will be paid in a lump sum one week after finishing the program, and those in Group 2 will be paid in three equal payments of MK 800 each as described above. Villages in Groups 3 and 4 will work in February, during Malawi's lean season and at a time of year when private sector demand for labor is extremely low. Those in Group 3 will be paid in a lump sum after finishing the program, while those in Group 4 will be paid in three equal payments of MK 800 each. Groups 2, 3 and 4 are new to the MASAF program. Groups 3 and 4 have one important characteristic of traditional public sector works programs: they offer employment during the lean season when other work is scarce.

## 6. PILOT LOCATION AND PARTNERS

The pilot evaluation began in December, 2011 with final data collection from pilot locations concluding in March 2012. This pilot focused exclusively on Ntchisi District, located in the Central Region one and a half hours northeast of Lilongwe. Mirroring the design of the full scale project, four village groups were included in the pilot. Each village group represented one of the four treatment arms of the full scale project, as illustrated in Table 6.1.

Table 6.1. Village assignments

	<b>December</b>	<b>February</b>
MASAF with <b>lump sum payment</b>	Mweso I (Group 1)	Lotinthankho (Group 3)
MASAF with <b>split payment</b>	Tikumane (Group 2)	Khwangwala (Group 4)

Three key objectives of this pilot study were to

- test the appropriateness of the proposed implementation timing and timeline.
- identify common variations in PWP implementation.
- gauge logistical and political feasibility, particularly around pay parades and delaying projects from December to February.

Three of the four projects included in the pilot were road maintenance projects. The fourth project, an afforestation project in the Lotinthankho group village, was selected for February implementation and lump sum payment. All four villages were rural, with XXX% of the population deriving their income exclusively from subsistence farming and ganyu labor. Only 8 percent had done any paid labor in the month before their participation in the public works program.

We first discuss the baseline characteristics of the sample.

While the small sample size leads to imprecise estimates, we note several important dimensions along which pre- to post-program changes differed between the four villages.