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Cash Transfers and Climate-resilient Development

Evidence from Zambia's Child Grant Programme

Kathleen Lawlor, Sudhanshu Handa, David Seidenfeld
and the Zambia Cash Transfer Evaluation Team

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CASH TRANSFERS AND CLIMATE-RESILIENT DEVELOPMENT: EVIDENCE FROM ZAMBIA'S CHILD GRANT PROGRAMME

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Abstract. Climate change is projected to dramatically disrupt rainfall patterns and agricultural yields in Sub-Saharan Africa, potentially stalling and even reversing gains that have been made in the region's fight against poverty. Many of the coping strategies the rural poor use to cope with failed harvests and other negative income shocks, such as reducing food consumption, selling off productive assets, and pulling children out of school, can mire households in poverty traps – the self-reinforcing conditions that cause poverty to persist. Avoiding detrimental coping strategies that degrade households' capabilities, and thus ability to escape poverty, is essential for building resilience to climate change. This study investigates whether cash transfers enable households facing weather and other negative shocks to avoid coping strategies that lead to poverty traps. We capitalize on the randomized roll-out of Zambia's Child Grant programme and a panel of 2,515 households to estimate impacts. The programme provides a monthly cash payment of 60 kwacha (U.S. $12) to poor households with children under the age of five. We find that in the face of shocks, cash empowers poor, rural households to employ coping strategies typically used by the non-poor, such as spending savings, and also enables them to substantially increase their food consumption and overall food security. This evidence demonstrates that extending relatively small cash payments unconditionally to the rural poor is a powerful policy option for fostering climate-resilient development.

Keywords: climate resilience, poverty, cash transfers, nutrition, Zambia

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1. INTRODUCTION

Climate change is projected to dramatically disrupt rainfall patterns and agricultural yields in Sub-Saharan Africa (IPCC, 2014). Given the large share of Africa's population living in rural areas (World Bank, 2013a) and these communities' dependence on rain-fed agriculture, climate change has the potential to stall and even reverse gains that have been made in the region's fight against poverty (Shepherd et al., 2013). Frequent exposure to failed harvests and other negative income shocks is a reality of life for the world's rural poor and many of these communities have developed strategies for coping with such shocks (Baez et al., 2013). However, some of these coping strategies can lead to poverty traps – the self-reinforcing conditions that cause poverty to persist. For example, coping with shocks by reducing food consumption, pulling children out of school, selling off productive assets, and adopting risk-averse livelihood strategies that discourage growth can negatively affect human capital formation and prospects for escaping poverty in the long run (Dasgupta, 1997; Carter and Barrett, 2006; Wood, 2011). The likelihood of households employing coping strategies that can lead to poverty traps may be greater in the face of weather shocks, given their potential impact on food supplies and livelihoods. Additionally, weather shocks' covariance across a community weakens informal safety nets, such as borrowing, further increasing household vulnerability (Skoufias, 2003; Baez et al., 2013; Boone et al., 2013). Avoiding detrimental coping strategies that degrade households' capabilities (per Sen, 1999), and thus ability to escape poverty, is essential for building resilience to climate change (Barrett and Constas, 2014).

This study investigates whether cash transfers enable households facing weather and other negative income shocks to avoid adverse coping strategies that can lead to poverty traps. To test this hypothesis, we harness data from the impact evaluation of Zambia's Child Grant Programme. The Child Grant Programme is one of the Government of Zambia's largest social protection programmes. The programme provides unconditional cash transfers of 60 kwacha (U.S. $12) per month to poor households with children under five years old. A randomized control trial was implemented with 2,515 households to investigate the impact of the programme on a range of protective and productive outcomes between 2010 and 2012, with the baseline data collected just prior to programme implementation. In addition to containing extensive information on both treatment and control households' consumption, income, assets, and schooling decisions, the study also records the specific types of shocks experienced by respondents as well as their stated coping strategies.

Weather shocks (droughts, floods, and storms) were the most commonly reported negative shock in both survey rounds. These weather shocks increased substantially between rounds, from 42% of the sample reporting such shocks in 2010 to 71% in 2012. Illness and changes in food prices were other commonly experienced shocks (22% and 35% in 2012, respectively), in addition to a multitude of other low-frequency shocks reported by households. Many households experienced multiple shocks and due to the increase in weather shocks over time, only 15% of households reported having completely avoided negative shocks in 2012. We investigate whether the cash transfer programme fostered household resilience in the face of these myriad shocks and examine the impacts of cash on both stated and revealed (i.e. behavioral) coping strategies. We also consider how the covariance of shocks across a community affects coping strategies.

Given the preponderance of shocks these households experienced and the knock-on effects of weather shocks in agricultural economies, we first develop a new framework for classifying negative shocks. Because weather shocks can affect not only households' *production* of agricultural goods for both home consumption and market sales, but also the *price* of these goods (due to increased scarcity or increased demand), we group together those shocks affecting agricultural production and prices. Next, we group together all other negative shocks affecting households' assets, labour supply, and other sources of income. In addition to its basis in economic theory, this framework also has the nice property of separating those shocks more likely to be covariate and exogenous to the household (the agricultural production and price shocks) from those more likely to be idiosyncratic and the result of endogenous household choices (the asset, labour, and other income shocks).

We find that amongst households facing agricultural production and price shocks, cash reduces the likelihood of reducing food consumption and increases the likelihood of employing more resilient coping strategies, such as spending savings. This analysis of stated coping strategies is supported by the behavioral data, which show that receiving cash enables households to smooth food consumption in the face of both covariate shocks affecting agricultural production and prices as well as other idiosyncratic shocks affecting households' labour, assets, and income. We also find that amongst those households facing repeated shocks, the covariance of shocks across a community increases the likelihood of being food insecure – but the cash transfer still works to dramatically decrease food insecurity.

However, our analysis suggests that the timing of the transfer may matter. Our data allow us to disentangle the effects of cash on coping with shocks, amongst those (1) shocked only at baseline, prior to programme implementation; (2) shocked only after the programme began; (3) repeatedly shocked; and (4) never shocked. The effect of cash on group (1) is akin to receiving cash as *ex-post* disaster aid, while the effect of cash on group (2) [and somewhat group (3)] is akin to receiving cash *ex-ante* as part of a proactive, climate-resilient development programme. We find that cash has strong, positive impacts on food security when the transfer is received prior to shock exposure, but some evidence that its impact may be weakened when received *ex-post*. But differential out-migration between treatment and control households experiencing weather shocks at baseline limits our ability to make strong causal statements regarding the timing of the cash transfer.

Taken together, these results have significant implications for the design of climate change adaptation programmes. While cash transfers are not routinely considered in the policy discourse concerning climate adaptation programming, because *ex-ante* transfers enable households to avoid negative coping strategies and even increase food consumption in the face of covariate weather shocks, cash transfers offer a sound approach for building climate-resilience amongst the world's most vulnerable and facilitating their "autonomous adaptation" to a changing environment (as suggested by Wood, 2011). And because cash also enables households to productively cope with the many other idiosyncratic shocks the rural poor routinely face, cash transfers offer a "no-regrets" approach for climate adaptation programmes (Wood, 2011).

2. POVERTY TRAPS, SHOCK COPING AND CASH TRANSFERS: THEORY AND EVIDENCE

On average, households tend to respond to negative income shocks by employing strategies that allow them to maintain their typical level of consumption (World Bank, 2013b). However, because poor households often lack access to mechanisms that facilitate consumption smoothing, such as insurance and credit, strategies of the poor for coping with shocks tend to differ from those of wealthier households (Morduch, 1995; Zimmerman and Carter, 2003; Carter et al., 2007; World Bank, 2013b). Evidence shows that the rich are likely to use savings, obtain credit, or work more in response to negative shocks, whereas the poor are more likely to sell off productive assets or reduce consumption (World Bank, 2013b). Moving children from school to the labour force is another coping strategy commonly employed by the poor (Beegle et al., 2004; de Janvry et al., 2006a and 2006b). The poor may also resort to increased harvesting of common-pool resources (e.g., firewood, bushmeat, etc.) to satisfy consumption and income needs in the face of shocks (Pattanayak and Sills, 2001).

All of these coping strategies commonly used by the poor can weaken their potential for escaping poverty in this generation or the next by reducing household production, hindering the cognitive development of young children via malnutrition, limiting household members' future schooling and work possibilities, or degrading the productivity of natural assets. This theory of 'poverty traps' is articulated most eloquently by Dasgupta (1997) and supported by numerous studies analyzing long-run poverty dynamics (e.g., Glewwe et al., 2000; Carter et al., 2007; Hoddinott et al., 2008; and as summarized by Barrett et al., 2007 and World Bank 2013b).

Classical theories of macroeconomic growth – unconditional and conditional convergence – are often applied at the microeconomic level for understanding household welfare trajectories (Carter and Barrett, 2006). These theories posit that all nations/individuals can grow economically along an exponential growth function. However, Barrett and Swallow (2005) and Carter and Barrett (2006) note that an economic growth function may include multiple dynamic equilibria and argue that the concept of poverty traps therefore contradicts classical theories of economic growth. Figure 1 depicts their description of poverty trap dynamics.

In the space of future well-being mapped onto current well-being, welfare dynamics create an S-shaped curve with three equilibrium points as shown. In this figure, W_{PL} marks the poverty line. Those at the middle equilibrium point (W_C) can easily be pushed down into the low-level (poor) equilibrium (W_L) by negative income or asset shocks or easily pushed up to the high-level (non-poor) equilibrium (W_H) by positive shocks. Once households find themselves at either the low- or high-level equilibrium they will tend to converge back to this point, despite small positive or negative income shocks that temporarily knock them off. Those at the low-level equilibrium are thus in a poverty trap; those that move above the middle equilibrium are moving along a self-propelled growth trajectory. This implies that those at the middle equilibrium are at a highly unstable point, which marks an important threshold.

Cash transfer programmes aim to help households escape poverty traps by providing cash that can be used to increase consumption of food, schooling, and health services, thereby increasing adults'

capacity for work and preventing the intergenerational transmission of poverty to children. Cash transfers should also foster resilience in the face of shocks and enable households to avoid coping strategies that lead to poverty traps (Blank et al., 2010) – but the relationship between transfers and shock responses has gone relatively unexamined, despite numerous impact evaluations of cash transfer programmes (Wood, 2011). Among the studies that have investigated this topic, the focus has been on households' use of child labour as a shock response and impacts on schooling [see studies of cash transfer programmes in Mexico by de Janvry et al. (2006a) and in Nicaragua by Gitter and Barham (2009) and Maluccio (2005)]. Moreover, these studies examine cases in Latin America, with evidence from African countries largely missing. Given greater dependence on subsistence farming, weaker infrastructure and social services, and more severe poverty in sub-Saharan Africa, results from Latin America probably cannot be generalized to the African context.

More research is currently needed to identify interventions that can help poor households avoid coping strategies associated with poverty traps in the face of shocks. Following the theory and evidence it might seem that the obvious answer is to make poor households non-poor via cash transfer programmes. However, identifying the thresholds that define poverty traps remains a difficult task (Carter and Barrett, 2006; Dercon, 2007) and Carter and Barrett (2006) argue these thresholds may best be identified by measuring assets rather than consumption or income levels, which are the targets of cash transfer programmes. This implies that cash transfers may not necessarily help households avoid poverty traps even if the transfer is predicted to push households above a consumption-based poverty line.

The weather-related risks posed by climate change, which will disproportionately affect the poor in developing countries (IPCC, 2014), increase the importance of identifying interventions that can help households living in remote rural areas respond to negative shocks.

3. THE ZAMBIAN CHILD GRANT PROGRAMME

The Zambian Child Grant Programme is an unconditional cash transfer programme being implemented by Zambia's Ministry of Community Development, Mother and Child Health. It is one of the Government of Zambia's largest social protection programmes. The goals of the programme are to reduce extreme poverty and the intergenerational transmission of poverty to children. In addition to the lack of conditionality, programme eligibility and administrative design are very straightforward (compared to most cash transfer programmes). The only eligibility criterion for the programme is that households have a child under the age of five. The size of the transfer is not adjusted for household size. In the initial phase of the programme, only households with children under age three were enrolled to ensure that every recipient household would receive the transfers for at least two years. Enrolled households receive the equivalent of about $12 per month, which is estimated to be the cost of purchasing one meal per day for an average-sized household for a month. Payments are received every other month from a local paypoint manager.

The Ministry of Community Development, Mother and Child Health began implementing the programme in 2010, in three districts with the highest rates of child mortality and malnutrition in

Zambia: Kalabo, Kaputa, and Shangombo. These districts are extremely remote, situated more than two days car travel from the country's capital, Lusaka, and share borders with Angola and the Democratic Republic of Congo. During the rainy season, Shangombo and Kaputa become cut off from the rest of the country by a floodplain and can only be reached by boat.

4. CONCEPTUAL FRAMEWORK

We examine whether receiving cash transfers affects households' shock coping and consider the wide range of possible strategies suggested in the literature to be commonly used by the poor. Because we are primarily interested in the relationship between cash transfers and poverty traps, we distinguish between (1) coping strategies hypothesized in the literature to lead to poverty traps, including reducing food consumption, selling assets, sending children away or to work, and doing casual labour for others;[1] and (2) other coping strategies, many of which are generally considered to be positive, such as starting a business, spending savings, and reducing non-food consumption. Borrowing from the valuation literature on stated and revealed preferences, we examine both households' stated coping strategies as well as their revealed coping strategies (i.e., behavioral responses measured in the data). For the revealed coping strategies, we focus on food consumption, given the centrality of this outcome to avoiding poverty traps and building human capital. We use two measures of this outcome: per capita monthly food consumption and whether a household ranks as severely food insecure, based on their response to a series of questions commonly used to measure food security.[2]

Following Dercon (2002), Carter and Maluccio (2003), Takasaki et al. (2004), and Debela et al. (2012), we distinguish between covariate and idiosyncratic shocks in our analysis, as the available strategy sets for dealing with each type of shock should differ, with covariate shocks posing greater risk of poverty trap coping (Skoufias, 2003). However, such a distinction is not necessarily easy to make. While extreme weather events and price changes should be covariate shocks and other negative shocks, such as job loss or illness tend to be idiosyncratic, this does not hold in all cases. For example, in the case of communicable disease, illness can affect a large portion of a community at once and where shocks are self-reported (as they are in our study), some might perceive a weather event as a negative shock while others take no notice of it.[3] The literature reflects various strategies for distinguishing between covariate and idiosyncratic shocks: (1) use of the household-specific community mean (e.g., Debela et al., 2012); (2) use of the general community mean (e.g., de Janvry et al., 2006a); or (3) establishing a (somewhat arbitrary) cut-off for what constitutes "covariate" (e.g., Carter and Maluccio, 2003).

A second conceptual challenge for shock coping studies concerns how to identify the impact of a specific shock (such as a weather shock) when households experience multiple shocks at once (e.g., a weather shock, illness, and job loss in the same year). Some choose to only examine one type of shock (e.g., Beegle et al., 2006; Jack and Suri, 2014) or examine shocks separately (e.g., de Janvry et al.,

[1]Casual labour for others ("piece work") is often considered a negative coping strategy in this region. Boone et al. (2013) note that in Malawi such casual labour ("*ganyu*") is often a coping strategy of last resort that can lead to poverty traps. This is because the labour on others' farms is very low-wage and typically results in farmers delaying planting time on their own fields, which reduces yields. They argue farmers engage in such a sub-optimal allocation of off-farm labour because farmers in subsistence economies are severely cash-constrained.

[2]Based on the FANTA food security scoring system.

[3]This latter point of course highlights the potential for endogeneity bias with self-reported shock data. We discuss how our estimation strategy addresses potential endogeneity concerns in Section 2.5.2.

2006), even though households might have experienced multiple shocks. How to classify and group together the numerous specific shocks households experience is another challenge, with no one framework consistently used in the literature. For example, Carter and Maluccio (2003) group together all reported shocks, including illness, job loss, crop failure, and theft, by converting them into monetary values of loss; while Debela et al. (2012) distinguish between labour and non-labour shocks.

We employ the common strategy of using the household-specific community mean, which is the per cent of the sample community that experienced a shock, exclusive of the household. This community mean measure is useful for investigating how a marginal increase in shock covariance across a community affects shock coping. But because we are particularly interested in weather shock coping, we also develop a new framework for categorizing shocks that allows us to distinguish the weather-related (and generally more covariate and plausibly exogenous) shocks from the non-weather (and generally more idiosyncratic, possibly endogenous) shocks. Agricultural households in rural developing economies tend to be both sellers and consumers of their own production. Weather shocks can therefore impact not only households' *production* of agricultural goods for both home consumption and market sales, but also the *price* of agricultural goods that might be purchased or sold by affecting their supply and demand. Additionally, weather shocks can increase crops' susceptibility to disease and pests, as well as damage crop storage facilities. For these reasons, we group together all shocks affecting agricultural production and prices. We then group together all other negative shocks affecting households' assets, labour supply, and non-farm income. And because our unique dataset contains households' accounts of how they coped with each specific shock, we can use this information to investigate the differences between how households cope with the largely covariate agricultural production and price shocks versus the more idiosyncratic asset, labour, and other non-farm income shocks.

We also compare the impacts of two policy design options: (1) extension of the cash transfer prior to experiencing a negative income shock and (2) extension of the transfer in the wake of the shock. This allows us to estimate the difference between what an *ex-post* disaster aid cash transfer programme might be able to accomplish with one that is focused on building households' climate resilience *ex-ante*.

5. DATA AND DESCRIPTIVE STATISTICS

Zambia's Child Grant Programme is being rolled out in phases, enabling the programme to first conduct a rigorous evaluation of the pilot phase before scaling up. The evaluation employs a multi-site, clustered randomized design. Thirty communities from each of three districts were first randomly assigned to either treatment or control status. All eligible households within treatment communities were then enrolled in the programme. Next, 28 households from each control and treatment community were randomly selected to participate in the study. Baseline surveys were administered prior to randomly assigning communities to treatment or control status and the start of the programme. In sum, in 2010, baseline data were collected from 2,515 households living in 90 communities (45 control, 45 treatment) across Kaputa, Kalabo, and Shangombo. A second round of data was collected in 2012.

In addition to collecting detailed information on children's health and schooling, households were asked about their consumption, income, assets, agricultural production, and other livelihood activities. Households were also surveyed about their exposure to a long list of potential negative income shocks as well as their specific coping strategies. Households in the sample are quite poor, with 92% living below the poverty line[4] and 90% ranking as severely food insecure. The vast majority are subsistence farmers, farming, on average, less than 1 hectare of land. At baseline, only 22% of households sold crops and only 13% purchased agricultural inputs (i.e., seeds, fertilizer, or pesticides). On average, households live 19 km from food markets, though there is considerable variation in the study sample.

There were 221 households that migrated out of the study area after the collection of baseline data (see Table 1). Handa et al. (2014) examine the effect this attrition had on the sample and find no differential attrition between the control and treatment groups in terms of rates or their observable household characteristics. These authors also investigate whether out-migration led to overall attrition bias (i.e., whether those who remain in the sample are, on average, different from the overall baseline sample). They find that the sample stays generally the same over time, in terms of observable household characteristics, with the principal difference being that those who remained in the sample were less likely to experience a weather shock at baseline. This follows from the observation that 72% of the households that left the study lived in Kaputa district at baseline, where a lake important for fishing and farming livelihoods is drying up, causing mass migration out of the area. While this out-migration due to weather shocks does not bias our results, it does have implications for external validity.

There was a sharp increase in the per cent of households experiencing negative weather shocks (droughts, floods, or storms) between the survey waves – from 42% in 2010 to 71% in 2012 (Table 2). When the shocks to crop production and prices, which are likely knock-on effects of the weather shocks, are factored in, a total of 81% of the sample experienced agricultural production and price shocks in 2012. Shocks to households' assets, labour, and non-farm income show much lower frequency in the sample (experienced by 36% of the sample in 2012) and their prevalence did not increase as sharply over time. Drought (47%), food price change (35%), floods (30%), illness (22%), livestock disease (11%), and crop disease/pests (11%) were the most commonly reported shocks (see Table 3).[5]

We investigate the covariance of each specific shock within communities by calculating the percent of the sample that experienced the shock for each community. Table 4 shows the average of these percentages for each shock. The average covariance levels for communities do not differ much from the averages for the overall sample (Table 3) and indicate that the agricultural production and price shocks are indeed much more covariate than the asset, labour, and other income shocks.

Households employed a wide range of coping strategies for dealing with these shocks. We asked households about their primary as well as secondary coping strategy for each shock they reported.

[4]Households with total expenditures less than 93.37 kwacha per person per month in 2010 are considered to be severely poor.
[5]In the survey, households were asked about 21 specific shocks. If they said they experienced the shock, they were then asked whether the effect was positive or negative. We limit our analysis to those shocks reported by households to have a negative effect.

We combine the primary and secondary strategies to compute the tallies in Table 5. All of the principal coping strategies identified in the literature as leading to poverty traps are represented in our dataset. We also classify "doing nothing" as a poverty trap coping strategy based on empirical analysis of household characteristics at baseline, which shows that households who "did nothing" in the wake of a shock had significantly lower food consumption than those who reported a different coping strategy, although they were similar along all other observable characteristics. Reducing food consumption (including "doing nothing") and doing piece work for others are the dominant poverty trap coping strategies in our dataset.

6. ESTIMATION STRATEGY

6.1. Testing assumptions of the impact estimates' econometric models

Due to random assignment of the programme, treatment status should not be correlated with observed or unobserved characteristics of participating households or communities. We confirm whether randomization yielded similar observable characteristics between treatment and control households by testing for their equivalence at baseline. We test for equivalence at baseline in terms of basic characteristics of the recipient/respondent and household, self-reported shocks, and our key outcomes of interest (stated and revealed coping strategies) and report these results in Tables 6 and 7. We restrict our analysis to just the panel of households that remained in the survey for both rounds, and cluster robust standard errors at the community-level (and do so for all subsequent models). We examine equivalence at baseline for all variations of the sample used in subsequent impact estimates: the full panel as well as the four shock sub-groups.

For the full panel, we find that randomization succeeded in producing balanced treatment and control groups. We find no significant differences between treatment and control households along observable characteristics, general shock exposure, and our key outcomes of interest – per capita food consumption and overall food security. Households in treatment communities, however, were 7 percentage points less likely to report an agricultural production or price shock at baseline (see Table 7).

We also find some interesting differences between control and treatment households at baseline in terms of stated coping strategies (Table 7). Prior to receiving cash, households in treatment communities were more likely to increase household production or reduce non-food expenses in the wake of agricultural production and price shocks than those residing in control communities. In the face of asset, labour, and other negative income shocks, treatment households were more likely to do piece work for others or participate in a work programme and less likely to obtain loans/gifts or "do nothing". These differences in stated shock coping strategies at baseline need to be considered when examining our impact estimates, and draw our focus to examination of just those stated coping strategies balanced at baseline.

Our analysis of revealed coping strategies (food consumption and food security score) breaks the full panel down into four shock sub-groups, based on the temporal trends of shock experience. We therefore test for equivalence at baseline for these four sub-groups as well and find that they are generally balanced in terms of observable characteristics and our key outcomes of interest. This

equivalence at baseline allows us to attribute any estimated differences in revealed coping strategies to the cash transfer programme. However, for those shocked at round 1 only, the control group has significantly lower per capita food consumption. This suggests that in response to shocks amongst households in the control group, it was the better off households who migrated out of the area and the poorer households who stayed. This lack of equivalence at baseline prevents us from examining the impact of cash on food consumption amongst those shocked only at baseline.

Next, we examine whether treatment and control households are experiencing the same time trend with respect to shock exposure. The time trend could be different due to either (1) differential weather patterns between treatment and control communities over time or (2) actual impacts of cash on the likelihood of experiencing or perceiving a shock (i.e., cash might reduce the likelihood of falling ill by improving nutrition or it might cause one to not notice a change in prices that other perceive as significant). To test for differential time trends, we run a difference-in-difference model, specified in Equation (1) as follows:

$$(1) \qquad Y_{igt} = B_0 + B_1 Post_{igt} + B_2 Cash_{ig} + B_3 (Post_{igt} * Cash_{ig}) + B_4 \boldsymbol{X}_{ig} + B_5 \boldsymbol{Z}_g + \boldsymbol{W}_g + E_{igt}$$

where Y_{igt} measures whether a shock was reported by household *i* in district *g* in period *t*, $Post_{igt}$ is a dummy variable equal to 1 if the observation is in 2012, $Cash_{ig}$ is a dummy variable equal to 1 if the household is in the treatment group, $\boldsymbol{X}_{ig}$ represents a vector of household and recipient characteristics measured at baseline, $\boldsymbol{Z}_g$, is a vector of baseline prices for food and other important consumption goods, $\boldsymbol{W}_g$ is a district fixed effect, and E_{igt} is the error term. We include controls for baseline characteristics and prices and district fixed effects to increase the precision of our estimates. The coefficient of interest in this model is B_3, which captures the effect of being in a treatment community on self-reported shocks.

The interaction variable (Cash*Post) representing the effect of cash on self-reported negative shocks is not significant for any of the three models presented in Table 8. Control and treatment households therefore appear to be experiencing the same time trends with respect to shock exposure.

6.2. Identification strategy for impact estimates

To understand the impact of cash on households' stated coping strategies, we run a series of first difference models using the 2012 survey data and restricted to those who reported a negative shock. This model can be written as:

$$(2) \qquad Y_{igt} = B_0 + B_1 Cash_{ig} + B_2 \boldsymbol{X}_{ig} + B_3 \boldsymbol{Z}_g + \boldsymbol{W}_g + E_{igt} \ \mid \ \text{Shock}_{2012}=1$$

where all terms are defined as they were in Equation (1), but now Y_{igt} is a dummy variable coded as 1 if a household reported using the specific coping strategy in question. The identifying assumption for this model is that both the treatment and control groups would have had, on average, similar, shock coping strategies in 2012, had the treatment group not received cash. However, our equivalence at baseline tests shows that this assumption does not hold for certain shock coping strategies. Therefore, we focus our discussion of results on those stated coping strategies balanced at baseline.

To further probe household coping strategies, we use both rounds of data and examine whether cash may have affected households' food consumption and overall food security score. Like Equation (2), these models are conditional on households' shock experience. We run four sets of models, as specified below:

(3) $Y_{igt} = B_0 + B_1 Post_{igt} + B_2 Cash_{ig} + B_3(Post_{igt} * Cash_{ig}) + B_4 \mathbf{X}_{ig} + B_5 \mathbf{Z}_g + \mathbf{W}_{gt} + (e_{igt} + \mu_{it} + v_i)$ | Shock2010=1 & Shock 2012=1 {Shocked both rounds}

(4) $Y_{igt} = B_0 + B_1 Post_{igt} + B_2 Cash_{ig} + B_3(Post_{igt} * Cash_{ig}) + B_4 \mathbf{X}_{ig} + B_5 \mathbf{Z}_g + \mathbf{W}_{gt} + (e_{igt} + \mu_{it} + v_i)$ | Shock2010=0 & Shock 2012=0 {Never shocked}

(5) $Y_{igt} = B_0 + B_1 Post_{igt} + B_2 Cash_{ig} + B_3(Post_{igt} * Cash_{ig}) + B_4 \mathbf{X}_{ig} + B_5 \mathbf{Z}_g + \mathbf{W}_{gt} + (e_{igt} + \mu_{it} + v_i)$ | Shock2010=1 & Shock 2012=0 {Shocked round 1 only}

(6) $Y_{igt} = B_0 + B_1 Post_{igt} + B_2 Cash_{ig} + B_3(Post_{igt} * Cash_{ig}) + B_4 \mathbf{X}_{ig} + B_5 \mathbf{Z}_g + \mathbf{W}_{gt} + (e_{igt} + \mu_{it} + v_i)$ | Shock2010=0 & Shock 2012=1 {Shocked round 2 only}

where terms reflect their definitions as described for Equations (1) and (2), though here Y_{igt} is, depending upon the series of models, monthly per capita food consumption or a dummy variable coded as 1 if the household ranks as severely food insecure. For the purposes of transparency, we also decompose the error term here into its various components, with e_{igt} representing truly random error and μ_{it} representing unobserved household characteristics that vary over time and v_i those that are time-invariant. Time-invariant characteristics at the level of the treatment group (i.e., on average) are removed in the differencing. And while, econometrically, unobserved time-varying characteristics at the level of the treatment group remain in the error (as well as μ_{it} and v_i), the randomized research design provides strong assurance that there are no systematic differences between the treatment and control groups along either observed or unobserved characteristics. Therefore, there is little reason to believe that our estimates reported in Tables 11 and 12 are biased by unobserved heterogeneity.

An alternative estimation strategy would be to run triple difference models on the full sample (where Cash is interacted with both Shock and Post) with household fixed effects (to control for unobserved time-invariant characteristics) to identify the effect of both receiving Cash and being shocked on food security. Jack and Suri (2014) take such an approach in their analysis of how Kenya's mobile money system enables households to cope with illness shocks. However, the challenge with these models is that they use only those who switch shock status between rounds to estimate the parameters of interest (i.e., treatment effects). In our dataset, such an analytical approach does not make sense given that many experienced shocks both rounds and amongst those that changed status over time, some went from no shock in 2010 to a shock in 2012, while others experienced the opposite time trend – so any effects of cash would be confounded by the experiences of these two sub-populations. From an econometric standpoint, given the shock frequencies in our data and our randomized research design, we believe our sets of difference-in-difference models are more appropriate (and more transparent). Moreover, by disaggregating the analysis according to the temporal experience of shocks, we are able to have a higher degree of external validity and answer an important policy design question: Does it matter whether cash is extended before or after a household experiences a negative shock?

7. RESULTS

We find that cash reduces the likelihood of employing negative coping strategies associated with poverty traps and increases the likelihood of employing positive coping strategies. Tables 9 and 10 present the impacts of cash on stated coping. We run two sets of models for each coping strategy: the first restricted to those who experienced agricultural production or price shocks in 2012; the second restricted to those who experienced an asset, labour, or other negative income shock in 2012. We find that amongst those who experienced an agricultural production or price shock, cash reduces the likelihood of reducing food consumption ("doing nothing") by 14 percentage points and increases the likelihood of spending savings by 6 percentage points. Cash also increases the likelihood of using social services (visiting the clinic or seeking help from the government or an NGO) by 2 percentage points in the case of agriculture and price shocks and by 12 percentage points for other shocks. Importantly, all of these stated coping strategies were balanced at baseline, implying that we can confidently attribute the observed differences reported here to the cash transfer programme.

These impacts of cash on stated coping strategies are supported by our analysis of the behavioral data, which shows that the programme has positive impacts on food consumption and overall food security (Tables 11 and 12).[6] We find that cash increases monthly per capita food expenditures by 31% for those never shocked, by 35% for those shocked only after programme implementation (round 2), and by 29% for those shocked both prior to and during the programme. [Because food consumption amongst those shocked only prior to the start of the programme (round 1) was not balanced at baseline, we can not estimate the impact of cash for this sub-group.] We see a similar trend with the food security scores. Cash decreases the probability of being severely food insecure by 24 percentage points amongst those never shocked, by 25 percentage points amongst those shocked at round 2 only, and by 25 percentage points amongst those shocked at both rounds. For those shocked at round 1 only, we do not find evidence that cash has any effect on food security.

We then add a variable measuring shock prevalence in each of the 90 sample communities to our difference-in-difference models to understand the effect of shock covariance on the impact of cash (see Tables 13 and 14). This variable is the per cent in each community sample reporting a shock, exclusive of the household. When this variable is added to the difference-in-difference models, the effects of cash on food consumption and food security remain relatively unchanged from the original estimates presented in Tables 11 and 12 – even though a one percentage point increase in community shock prevalence increases the likelihood of being food insecure by 14 percentage points for those shocked both rounds. For these two shock groups we also see that a one percentage point increase in community shock prevalence increases their food consumption by 30 and 33 percent, respectively. This suggests that the mechanism by which cash increases food security in the face of covariate shocks is by enabling households to increase food production and/or purchases.

[6]For these difference-in-difference models, we group together agricultural production and price shocks with asset, labour, and other income shocks, since many households experienced both types of shocks and it is not possible to disentangle their effects in the revealed data measuring food consumption and food security.

8. CONCLUSIONS AND POLICY IMPLICATIONS

We find that cash transfers enable households to cope with negative shocks in ways that do not increase the likelihood of falling into a poverty trap. Cash empowers the poor, rural households in our study to employ shock-coping strategies commonly used by the non-poor, such as spending savings. The cash transfers provided by Zambia's Child Grant Programme are able to increase both food consumption and food security even while the covariance of shocks within a community increases the likelihood of being severely food insecure.

The most recent report from the Intergovernmental Panel on Climate Change (IPCC, 2014) states that

> "Throughout the 21st century, climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps (p. 20) …".

Our study provides evidence of a programme – unconditional cash transfers – that can work to help households avoid the poverty traps that climate change threatens to create and entrench. Moreover, we show that a specific programme design feature – extending cash to households before severe shocks to agricultural production and prices occur – achieves strong, positive impacts on food consumption and food security.

The international community concerned with climate change has become increasingly focused on developing adaptation strategies in recent years. Crop insurance (Barrett et al., 2007; Baez et al., 2013) and "ecosystem-based adaptation" (FAO and UNEP, 2013) are two potential adaptation strategies that have received a great deal of attention – and for Africa in particular. However, the concept of using *ex-ante* cash transfer programmes (i.e., as opposed to *ex-post* cash or in-kind disaster relief) as an adaptation strategy for rural Africa has received little attention. This may be due to limited interaction between the environmental policy community and the social protection community. There is clearly a need to link these two policy communities and their attendant literatures.

While Wood (2011) argues that cash transfers should be given a greater role in climate adaptation and the recent World Development Report (World Bank, 2013b) also highlights the value of cash transfers for risk management and shock-coping in the context of climate change, to date there have been no published evaluations of cash transfer programmes that focus on climate and adaptation questions.[7] This study therefore fills an important gap in the literature and offers policy-relevant evidence that should inform the design of climate adaptation programmes.

One advantage cash transfers offer over other potential adaptation interventions is their unique ability to address the context of climate change, which is characterized by "deep uncertainty." In their discussion of the economics of risk and uncertainty in the 2014 World Development Report, The World

[7]Asfaw et al. (2011), however, report they are currently studying the impact of Lesotho's cash transfer programme on farmers' adaptation strategies, with a particular focus on changes in a series of specific farming practices. The 2014 World Development Report also reports advance results from evaluations of how cash transfer programmes in Ethiopia and El Salvador have helped households cope with droughts and natural disasters (World Bank, 2013(b), p. 104-105).

Bank describes problems of deep uncertainty as those where "…experts cannot agree on which models to use…; on the probability distributions of key uncertain parameters…; or on the values of alternative outcomes" (2013b, p. 93). Climate change is one such problem, because while models converge on predictions of disrupted rainfall patterns in Africa, at the local level models diverge – some predict decreases in rainfall and droughts, others predict increased rainfall and floods. Given that cash transfers have already been demonstrated by numerous studies (Fiszbein and Schady, 2009) to reduce both short-term poverty and its long-term determinants, they therefore offer a "no regrets" (Woods, 2011) strategy for climate-resilient development policy. Further, as also argued by Woods (2011) cash transfers facilitate individuals' autonomous adaptation and development decisions, making them both congruent with a human rights framework that recognizes the importance of agency as well as adaptation frameworks that embrace locally-based and diverse solutions.

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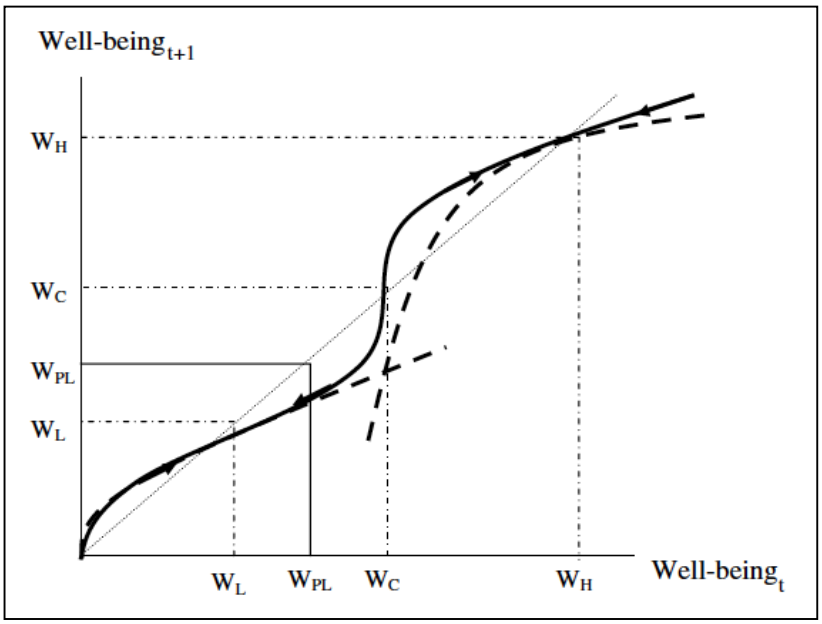
APPENDIX: FIGURES AND TABLES

Figure 1. Welfare dynamics under the poverty trap hypothesis



From Barrett and Swallow (2005), p. 4

Table 1. Study sample sizes[1]

	Treatment	Control	Total
2010	1,259	1,260	2,519
2012	1,145	1,153	2,298
Total	2,404	2,413	4,817

[1] 221 households migrated out of the sample

Table 2. Shocks experienced during 12 months prior to collection of baseline data in 2010 and round 2 in 2012

	2010			2012		
	Full sample (n=2,519)	Treatment (n=1,260)	Control (n=1,259)	Full sample (n=2,298)	Treatment (n=1,153)	Control (n=1,145)
No shock	922 (37)%	476 (38)%	446 (35%)	341 (15%)	169 (15%)	172 (15%)
Any shock	1,597 (63%)	784 (62%)	813 (65%)	1,957 (85%)	984 (85%)	973 (85%)
Agricultural production and price shocks	1319 (52%)	614 (49%)	705 (56%)	1852 (81%)	939 (81%)	913 (80%)
Weather shocks	1058 (42%)	484 (38%)	574 (46%)	1632 (71%)	828 (72%)	804 (70%)
Crop and price shocks	740 (29%)	352 (28%)	388 (31%)	1404 (61%)	681 (59%)	723 (63%)
Asset, labour, and other income shocks	694 (28%)	357 (28%)	337 (27%)	822 (36%)	380 (33%)	442 (39%)

Table 3. Specific shocks experienced

	2010			2012	
Negative Shocks	Full sample (n=2,519)	Treatment (n=1,260)	Control (n=1,259)	Full sample (n=2,298)	Treatment (n=1,153)	Control (n=1,145)
Agricultural production and price shocks						
Flood	851 (34%)	375 (30%)	476 (38%)	690 (30%)	382 (33%)	308 (27%)
Food price change	368 (15%)	180 (14%)	188 (15%)	813 (35%)	401 (35%)	412 (36%)
Drought	318 (13%)	160 (13%)	158 (13%)	1080 (47%)	536 (46%)	544 (48%)
Crop disease/pests	172 (7%)	88 (7%)	84 (7%)	244 (11%)	115 (10%)	129 (11%)
Storms	95 (4%)	43 (3%)	52 (4%)	63 (3%)	17 (1%)	46 (4%)
Crop price change	78 (3%)	25 (2%)	53 (4%)	174 (8%)	80 (7%)	94 (8%)
Crops damaged in storage	62 (2%)	30 (2%)	32 (3%)	59 (3%)	27 (2%)	32 (3%)
Input price change	60 (2%)	29 (2%)	31 (2%)	114 (5%)	58 (5%)	56 (5%)
Asset, labour, and other income shocks						
Illness	468 (19%)	243 (19%)	225 (18%)	504 (22%)	210 (18%)	294 (26%)
Business collapse	97 (4%)	50 (4%)	47 (4%)	37 (2%)	22 (2%)	15 (1%)
Death other household member	74 (3%)	36 (3%)	38 (3%)	107 (5%)	55 (5%)	52 (5%)
Death household head	65 (3%)	30 (2%)	35 (3%)	30 (1%)	15 (1%)	15 (1%)
Livestock disease	51 (2%)	23 (2%)	28 (2%)	250 (11%)	119 (10%)	131 (11%)
Person joined household	39 (2%)	21 (2%)	18 (1%)	50 (2%)	24 (2%)	26 (2%)
Injury	37 (1%)	20 (2%)	17 (1%)	13 (1%)	6 (1%)	7 (1%)
Inability to pay back loan	19 (1%)	10 (1%)	9 (1%)	4 (<1%)	3 (<1%)	1 (<1%)
Fewer loans/gifts	11 (<1%)	6 (<1%)	5 (<1%)	9 (<1%)	4 (<1%)	5 (<1%)
Job loss	9 (<1%)	6 (<1%)	3 (<1%)	11 (<1%)	6 (1%)	5 (<1%)
Conflict	8 (<1%)	1 (<1%)	7 (1%)	18 (1%)	12 (1%)	6 (1%)

Table 4. Covariance of shocks: Average per cent reporting the shock within a community cluster, averaged across communities

	2010			2012		
Negative shocks	Full sample (n=90)	Treatment (n=45)	Control (n=45)	Full sample (n=90)	Treatment (n=45)	Control (n=45)
Any shock	63%	62%	65%	85%	85%	85%
Agricultural production and price shocks						
Flood	34%	30%	38%	29%	32%	26%
Food price change	15%	14%	15%	36%	35%	36%
Drought	13%	13%	13%	47%	47%	47%
Crop disease/pests	7%	7%	7%	10%	10%	11%
Storms	4%	3%	4%	3%	2%	4%
Crop price change	3%	2%	4%	8%	7%	8%
Crops damaged in storage	2%	2%	3%	3%	2%	3%
Input price change	2%	2%	2%	5%	5%	5%
Asset, labour, and other income shocks						
Illness	19%	20%	18%	22%	18%	26%
Business collapse	4%	4%	4%	2%	2%	1%
Death other household member	3%	3%	3%	5%	5%	5%
Death household head	3%	2%	3%	1%	1%	1%
Livestock disease	2%	2%	2%	11%	11%	12%
Person joined household	2%	2%	1%	2%	2%	3%
Injury	1%	2%	1%	1%	1%	1%
Inability to pay back loan	1%	1%	1%	<1%	<1%	<1%
Fewer loans/gifts	<1%	<1%	<1%	<1%	<1%	<1%
Job loss	<1%	<1%	<1%	<1%	1%	<1%
Conflict	<1%	<1%	<1%	<1%	<1%	<1%

Table 5. Coping strategies employed by households experiencing negative shocks

Coping strategy	Full sample (n=1,597)	**2010** Treatment (n=784)	Control (n=813)	Full sample (n=1,957)	**2012** Treatment (n=984)	Control (n=973)
Coping strategies associated with poverty traps						
Did nothing	664 (42%)	288 (37%)	376 (46%)	988 (62%)	457 (46%)	531 (55%)
Piece work for others (farm or non-farm)	642 (40%)	313 (40%)	329 (40%)	645 (33%)	314 (32%)	331 (34%)
Reduced food consumption	228 (14%)	113 (14%)	115 (14%)	223 (11%)	93 (9%)	130 (13%)
Sold assets	40 (3%)	20 (3%)	20 (2%)	64 (3%)	26 (3%)	38 (4%)
Sent children to relatives/friends	26 (2%)	14 (2%)	12 (1%)	18 (1%)	9 (1%)	9 (1%)
Sent children to work/sell	5 (<1%)	2 (<1%)	3 (<1%)	0	0	0
Other coping strategies						
Loans/gifts from family, friends, or lender	394 (25%)	174 (22%)	220 (27%)	274 (14%)	131 (13%)	143 (15%)
Worked more hours, grew/sold more crops, or started a business	325 (20%)	175 (22%)	150 (18%)	371 (19%)	208 (21%)	163 (17%)
Sought help from government, NGO, or clinic	244 (15%)	129 (16%)	115 (14%)	235 (12%)	95 (10%)	140 (14%)
Spent savings	185 (12%)	83 (11%)	102 (13%)	275 (14%)	169 (17%)	105 (11%)
Work-for-food or Work-for-assets programme	140 (9%)	64 (8%)	76 (9%)	72 (4%)	40 (4%)	32 (3%)
Reduced non-food expenses	136 (9%)	74 (10%)	62 (8%)	291 (15%)	160 (16%)	131 (13%)
Migrated for work or moved house/field	47 (3%)	16 (2%)	31 (4%)	16 (1%)	10 (1%)	6 (1%)
Used cash transfer	0	0	0	0	25 (3%)	0

Table 6. Mean characteristics and equivalence at baseline tests for full panel as well as four shock sub-group panels in 2010[1]

	Full Panel		No shock either round		Shock round 1 only		Shock round 2 only		Shocked both rounds	
	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control	Treatment	Control
Sample size	(1,153)	(1,145)	(55)	(67)	(114)	(105)	(373)	(337)	(611)	(636)
Recipient characteristics										
Age	30	30	28	30	31	30	30	29	30	30
Attended school	73%	70%	78%*	62%*	72%	76%	71%	66%	75%	72%
Married	74%	71%	71%	64%	74%	66%	79%	75%	71%	71%
Male	1.2%	0.5%	0%	0%	3%*	0%*	1%*	0%*	1%	1%
Household characteristics										
Wealth index	0.002	-0.04	-0.12	-0.04	0.08	-0.06	0.05	-0.06	-0.03	-0.02
Below 2010 poverty line	92%	92%	93%	96%	85%	89%	94%	94%	92%	91%
Household size	6	6	6	5	6	6	6	6	6	6
Members age 0-5	2	2	2	2	2	2	2	2	2	2
Members age 6-12	1	1	1	1	1	1	1	1	1	1
Members age 13-18	1	1	1	0	1	1	1	1	1	1
Members age 19-35	1	1	1	1	1	1	1	1	1	1
Members age 36-55	1	1	0	0	1	1	1	1	1	1
Members age 56-79	0	0	0	0	0	0	0	0	0	0
Members 70+	0	0	0	0	0	0	0	0	0	0
Kilometers to food market	16	22	23	34	20	30	14*	23*	16	19
Per cent from each district										
Kaputa	30%	29%	33%	48%	24%	38%	39%	39%	25%	21%
Kalabo	35%	35%	29%	36%	50%	44%	23%	25%	41%	39%
Shangombo	35%	35%	38%	16%	26%	18%	39%	36%	34%	40%
Revealed coping strategies										
Monthly per capita food consumption (kwacha)	30.16	28.50	24.03	24.89	40.73***	32.57***	26.61	26.58	31.71	29.60
Severely food insecure	90%	90%	96%	88%	87%	92%	91%	90%	89%	90%

[1]All samples restricted to those who remain in the panel survey in 2012. Means and tests for significant difference are regression-adjusted to account for clustered randomized design. Revealed coping strategy regressions include controls for recipient characteristics (age, education, marital status), household characteristics (wealth, household size and demographic composition, distance to food market), district fixed effects and a vector of baselines prices (maize/grain, rice, beans, fish, oil, sugar, salt, hand soap, liquid soap). *** indicates significantly different from control group at the 99% level, ** at the 95% level, and * at the 90% level.

Table 7. Equivalence at baseline tests for exposure of full panel to shocks and stated coping strategies in 2010[1,2]

	Significantly different for treatment households
Shocks	
Agricultural production or price shock	7 percentage points less likely*
Asset, labour, and other income shock	
Any shock	
Stated coping strategies associated with poverty traps	
Did nothing	9 percentage points less likely** (Other Shocks)
Piece work for others (farm or non-farm)	9 percentage points more likely* (Other Shocks)
Reduced food consumption	
Other stated coping strategies	
Loans/gifts from family, friends, or lender	10 percentage points less likely** (Other Shocks)
Worked more hours, grew/sold more crops, or started a business	5 percentage points more likely* (Ag/Price Shocks)
Sought help from government, NGO, or clinic	
Spent savings	
Work-for-food or Work-for-assets programme	3 percentage points more likely* (Other Shocks)
Reduced non-food expenses	3 percentage points more likely* (Ag/Price Shocks)

[1]Sample restricted to those who remain in the panel survey in 2012. Regressions include controls for recipient characteristics (age, education, marital status), household characteristics (wealth, household size and demographic composition, distance to food market), district fixed effects and a vector of baselines prices (maize/grain, rice, beans, fish, oil, sugar, salt, hand soap, liquid soap). Robust standard errors are clustered at the community level to account for the clustered randomized design. *** indicates significant differences at the 99% level, ** at the 95% level, and * at the 90% level.

[2]Analysis restricted to those coping strategies employed by 5% or more of households in at least one of the four time/treat sub-groups (i.e., 2010 control group that experienced shock, 2010 treatment group that experienced shock, etc.).

Table 8. Equivalent time trends between treatment and control households with respect to shock exposure[1]

	Dependent variables (1/0 – Linear probability models)		
	Agricultural production or price shock	*Asset, labour, and other income shock*	*Any shock*
Constant	0.54***	0.12	0.57***
	(0.13)	(0.12)	(0.12)
Time	0.24***	0.12***	0.20***
	(0.04)	(0.05)	(0.03)
Treatment	-0.08**	0.002	-0.04
household	(0.04)	(0.03)	(0.04)
Treatment	0.08	-0.07	-0.02
household * Time	(0.05)	(0.06)	(0.05)
Recipient characteristics			
Age	0.001	0.002*	0.002
	(0.001)	(0.001)	(0.001)
Attended school	0.05***	0.03	0.05***
	(0.02)	(0.02)	(0.01)
Married	0.03	-0.02	0.001
	(0.02)	(0.02)	(0.02)
Household characteristics			
Wealth index	-0.01	0.03***	0.003
	(0.01)	(0.01)	(0.01)
Household size	0.002	-0.03	0.003
	(0.02)	(0.02)	(0.02)
Members age 0-5	0.0002	0.03	-0.003
	(0.02)	(0.02)	(0.02)
Members age 6-12	-0.01	0.05**	-0.002
	(0.02)	(0.02)	(0.02)
Members age 13-18	-0.01	0.02	-0.02
	(0.02)	(0.03)	(0.02)
Members age 19-35	-0.01	0.01	-0.005
	(0.02)	(0.02)	(0.02)
Members age 36-55	0.02	0.005	0.02
	(0.02)	(0.02)	(0.02)
Kilometers to food	-0.02*	-0.03**	-0.02**
market (logged)	(0.01)	(0.01)	(0.01)
Regional characteristics			
Kaputa District	-0.22***	-0.01	-0.16***
	(0.04)	(0.04)	(0.04)
Shangombo District	-0.03	0.05	0.005
	(0.04)	(0.05)	(0.04)
N	4518	4518	4518

[1]Sample restricted to those who remain in the panel survey in 2012; robust standard errors are clustered at the community level to account for the clustered randomized design and included in parentheses below coefficients. Parameter estimates for vector of baseline prices (maize/grain, rice, beans, fish, oil, sugar, salt, hand soap, liquid soap) not shown. Kalabo district omitted. *** indicates significant differences at the 99% level, ** at the 95% level, and * at the 90% level.

Table 9. The impact of cash on coping strategies associated with poverty traps amongst households experiencing negative income shocks in the 12 months prior to collection of round 2 data in 2012[1,2]

Dependent variable: coping strategy employed (1) – Linear probability model			
	Did Nothing	*Piece work for others*	*Reduced food consumption*
	Agric./Price	Agric./Price	Agric./Price
Constant	0.87***	0.19	0.03
	(0.18)	(0.14)	(0.15)
Cash	-0.14***	0.01	-0.03
	(0.04)	(0.03)	(0.03)
Recipient characteristics			
Age	-0.001	-0.001	0.002
	(0.002)	(0.001)	(0.001)
Attended school	0.01	-0.04*	0.007
	(0.02)	(0.02)	(0.02)
Married	-0.02	0.02	0.02
	(0.03)	(0.02)	(0.02)
Household characteristics			
Wealth index	-0.01	-0.02*	-0.01*
	(0.01)	(0.01)	(0.01)
Household size	-0.04	0.04	-0.03
	(0.04)	(0.03)	(0.02)
Members age 0-5	0.05	-0.05	0.04
	(0.04)	(0.03)	(0.02)
Members age 6-12	0.05	-0.03	0.03
	(0.04)	(0.03)	(0.02)
Members age 13-18	0.04	-0.04	0.04
	(0.04)	(0.03)	(0.03)
Members age 19-35	0.05	-0.04	0.03
	(0.04)	(0.03)	(0.03)
Members age 36-55	0.05	-0.04	0.02
	(0.04)	(0.04)	(0.03)
Kilometers to food market (logged)	0.004	-0.001	0.02**
	(0.01)	(0.01)	(0.01)
Regional characteristics			
Kaputa	0.15**	-0.11***	-0.10*
	(0.06)	(0.03)	(0.05)
Shangombo	-0.49***	0.45***	0.02
	(0.06)	(0.05)	(0.05)
N	1823	1823	1823

[1]Sample restricted to those who remain in the panel survey in 2012; robust standard errors are clustered at the community level to account for the clustered randomized design and included in parentheses below coefficients. Parameter estimates for vector of baseline prices (maize/grain, rice, beans, fish, oil, sugar, salt, hand soap, liquid soap) not shown. Kalabo district omitted. *** indicates significant differences at the 99% level, ** at the 95% level, and * at the 90% level.

[2]Analysis restricted to those coping strategies (1) employed by 5% or more of households in at least one of the four time/treat sub-groups (i.e., 2010 control group that experienced shock, 2010 treatment group that experienced shock, etc.) and (2) balanced at baseline. No coping strategies associated with poverty traps met these criteria in the case of non-agricultural/price shocks.

Table 10. The impact of cash on coping strategies not associated with poverty traps amongst households experiencing negative income shocks in the 12 months prior to collection of round 2 data in 2012[1,2]

Dependent variable: coping strategy employed (1) – Linear probability model	*Loans or gifts*	*Grew/sold additional crops, worked more, started business*	*Sought help from government or NGO*		*Spent savings*		*Work-for-food/ Work-for-assets*
	Ag/Price	Other	Agric./Price	Other	Agric./Price	Other	Agric./Price
Constant	0.005	-0.04	0.02	0.15	-0.02	0.04	-0.03
	(0.10)	(0.12)	(0.02)	(0.21)	(0.09)	(0.17)	(0.08)
Cash	0.002	0.03	0.02**	0.12**	0.06***	0.04	0.0004
	(0.02)	(0.03)	(0.01)	(0.06)	(0.02)	(0.04)	(0.01)
Recipient characteristics							
Age	0.002**	0.002	0.003	0.0002	0.0001	0.0003	-0.001
	(0.001)	(0.002)	(0.0003)	(0.002)	(0.001)	(0.002)	(0.001)
Attended school	0.02	0.03	0.004	-0.07**	-0.003	-0.03	0.01
	(0.02)	(0.02)	(0.007)	(0.03)	(0.02)	(0.03)	(0.01)
Married	-0.01	-0.08***	-0.003	0.06	-0.001	0.04	-0.01
	(0.02)	(0.03)	(0.01)	(0.04)	(0.01)	(0.04)	(0.01)
Household characteristics							
Wealth index	0.0002	0.0003	-0.002	-0.02	0.03***	0.02*	-0.01*
	(0.005)	(0.01)	(0.001)	(0.02)	(0.01)	(0.01)	(0.003)
Household size	-0.03	-0.02	-0.01*	-0.07**	-0.002	0.001	0.01
	(0.02)	(0.03)	(0.004)	(0.03)	(0.03)	(0.03)	(0.01)
Members age 0-5	0.03	-0.002	0.004	0.08**	-0.01	-0.01	-0.004
	(0.02)	(0.03)	(0.004)	(0.03)	(0.03)	(0.04)	(0.01)
Members age 6-12	0.02	0.03	0.006*	0.08**	0.01	0.0002	-0.02
	(0.02)	(0.03)	(0.003)	(0.04)	(0.03)	(0.04)	(0.01)
Members age 13-18	0.03	0.03	0.01	0.08**	-0.001	0.002	-0.01
	(0.02)	(0.04)	(0.005)	(0.03)	(0.03)	(0.04)	(0.01)
Members age 19-35	0.02	0.04	0.01*	0.04	-0.01	0.01	-0.01
	(0.02)	(0.04)	(0.01)	(0.03)	(0.03)	(0.04)	(0.02)
Members age 36-55	0.01	0.04	0.01*	0.0001	-0.01	-0.004	-0.0002
	(0.02)	(0.04)	(0.004)	(0.03)	(0.03)	(0.04)	(0.01)
Kilometers to food market (logged)	-0.01	0.01	0.003	-0.03	0.02***	-0.01	0.002
	(0.01)	(0.01)	(0.002)	(0.02)	(0.01)	(0.02)	(0.004)

Regional characteristics							
Kaputa	-0.05*	-0.04	-0.003	-0.20***	-0.01	-0.06	-0.001
	(0.03)	(0.04)	(0.005)	(0.07)	(0.03)	(0.06)	(0.01)
Shangombo	-0.01	0.14**	0.01	0.09	0.02	-0.10*	0.08***
	(0.04)	(0.06)	(0.01)	(0.08)	(0.03)	(0.06)	(0.02)
N	1823	809	1823	809	1823	809	1823

[1]Sample restricted to those who remain in the panel survey in 2012; robust standard errors are clustered at the community level to account for the clustered randomized design and included in parentheses below coefficients. Parameter estimates for vector of baseline prices (maize/grain, rice, beans, fish, oil, sugar, salt, hand soap, liquid soap) not shown. Kalabo district omitted. *** indicates significant differences at the 99% level, ** at the 95% level, and * at the 90% level.

[2]Analysis restricted to those coping strategies (1) employed by 5% or more of households in at least one of the four time/treat sub-groups (i.e., 2010 control group that experienced shock, 2010 treatment group that experienced shock, etc.) and (2) balanced at baseline.

Table 11. The impact of cash on food consumption amongst households experiencing and avoiding negative income shocks[1,2]

Dependent variable: Per capita food consumption (logged)			
	No shock either round	*Shock round 2 only*	*Shock both rounds*
Constant	10.5***	10.4***	10.7***
	(0.49)	(0.25)	(0.22)
Time	0.39***	0.26***	0.10
	(0.09)	(0.08)	(0.06)
Cash	0.07	-0.03	0.04
	(0.17)	(0.06)	(0.06)
Cash*Time	**0.31***	**0.35*****	**0.29*****
	(0.17)	(0.10)	(0.09)
Recipient characteristics			
Age	0.01	0.005*	0.0004
	(0.01)	(0.002)	(0.002)
Attended school	0.06	0.08**	0.11***
	(0.11)	(0.04)	(0.04)
Married	-0.10	-0.01	0.05
	(0.09)	(0.05)	(0.04)
Household characteristics			
Wealth index	0.11	0.15***	0.16***
	(0.07)	(0.02)	(0.02)
Household size	-0.12	-0.01	-0.05
	(0.12)	(0.05)	(0.04)
Members age 0-5	-0.08	-0.11*	-0.10**
	(0.12)	(0.06)	(0.05)
Members age 6-12	-0.05	-0.11*	-0.08*
	(0.12)	(0.06)	(0.04)
Members age 13-18	0.04	-0.01	-0.05
	(0.14)	(0.06)	(0.05)
Members age 19-35	0.18	-0.03	-0.06
	(0.13)	(0.06)	(0.05)
Members age 36-55	0.15	-0.03	-0.01
	(0.11)	(0.06)	(0.05)
Kilometers to food market (logged)	-0.02	0.02	0.03*
	(0.04)	(0.02)	(0.02)
Regional characteristics			
Kaputa	-0.38**	-0.22***	-0.20***
	(0.16)	(0.08)	(0.07)
Shangombo	-0.45***	-0.31***	-0.24***
	(0.12)	(0.06)	(0.07)
N	240	1393	2455

[1]Sample restricted to those who remain in the panel survey in 2012; robust standard errors are clustered at the community level to account for the clustered randomized design and included in parentheses below coefficients. Parameter estimates for vector of baseline prices (maize/grain, rice, beans, fish, oil, sugar, salt, hand soap, liquid soap) not shown. Kalabo district omitted. *** indicates significant differences at the 99% level, ** at the 95% level, and * at the 90% level.

[2]Analysis restricted to those shock groups balanced at baseline along per capita food consumption.

Table 12. The impact of cash on food security amongst households experiencing and avoiding negative income shocks[1]

Dependent variable: Severely food insecure (1) – Linear Probability Model				
	No shock either round	*Shock round 1 only*	*Shock round 2 only*	*Shock both rounds*
Constant	1.40***	1.0***	0.94***	1.17***
	(0.25)	(0.18)	(0.10)	(0.11)
Time	-0.05	-0.08	-0.04	-0.07**
	(0.08)	(0.05)	(0.03)	(0.03)
Cash	0.05	-0.01	0.03	0.01
	(0.07)	(0.05)	(0.03)	(0.04)
Cash*Time	**-0.24****	-0.0004	**-0.25*****	**-0.20*****
	(0.11)	(0.07)	(0.04)	(0.04)
Recipient characteristics				
Age	-0.004	0.002	0.004***	0.0005
	(0.004)	(0.002)	(0.001)	(0.001)
Attended school	0.05	-0.01	-0.001	-0.05**
	(0.07)	(0.04)	(0.02)	(0.02)
Married	-0.03	0.004	-0.05*	-0.03*
	(0.05)	(0.05)	(0.03)	(0.02)
Household characteristics				
Wealth index	-0.04	-0.04**	-0.03***	-0.04***
	(0.02)	(0.02)	(0.01)	(0.01)
Household size	0.05	0.05	-0.01	-0.01
	(0.09)	(0.04)	(0.04)	(0.03)
Members age 0-5	-0.12	-0.02	0.04	0.06**
	(0.09)	(0.04)	(0.04)	(0.03)
Members age 6-12	-0.03	-0.02	0.02	0.02
	(0.09)	(0.05)	(0.03)	(0.03)
Members age 13-18	-0.09	-0.07	0.01	0.04
	(0.11)	(0.05)	(0.04)	(0.03)
Members age 19-35	-0.05	-0.07	0.04	-0.003
	(0.10)	(0.05)	(0.04)	(0.03)
Members age 36-55	-0.03	-0.05	0.004	-0.02
	(0.08)	(0.04)	(0.04)	(0.03)
Kilometers to food market (logged)	-0.04*	-0.003	-0.001	-0.01
	(0.02)	(0.02)	(0.01)	(0.01)
Community characteristics				
Kaputa	0.09	0.01	0.01	-0.01
	(0.10)	(0.06)	(0.04)	(0.04)
Shangombo	-0.04	-0.15*	-0.02	-0.13***
	(0.09)	(0.09)	(0.06)	(0.04)
N	240	428	1385	2445

[1]Sample restricted to those who remain in the panel survey in 2012; robust standard errors are clustered at the community level to account for the clustered randomized design and included in parentheses below coefficients. Parameter estimates for vector of baseline prices (maize/grain, rice, beans, fish, oil, sugar, salt, hand soap, liquid soap) not shown. Kalabo district omitted. *** indicates significant differences at the 99% level, ** at the 95% level, and * at the 90% level.

Table 13. The impact of cash on food consumption amongst households experiencing and avoiding negative income shocks, controlling for the effect of shock covariance[1,2]

Dependent variable: Per capita food consumption (logged)			
	No shock either round	*Shock round 2 only*	*Shock both rounds*
Constant	10.3***	10.2***	10.5***
	(0.50)	(0.27)	(0.22)
Time	0.35***	0.16**	0.05
	(0.09)	(0.08)	(0.06)
Cash	0.06	-0.03	0.06
	(0.16)	(0.06)	(0.06)
Cash*Time	**0.31***	**0.34*****	**0.28*****
	(0.17)	(0.10)	(0.08)
Community shock covariance	0.25	**0.34****	**0.29****
(fraction excluding household)	(0.24)	(0.14)	(0.14)
Recipient characteristics			
Age	0.01	0.005*	0.0002
	(0.01)	(0.002)	(0.002)
Attended school	0.06	0.08**	0.11***
	(0.11)	(0.04)	(0.04)
Married	-0.10	-0.01	0.05
	(0.09)	(0.05)	(0.04)
Household characteristics			
Wealth index	0.10	0.15***	0.16***
	(0.07)	(0.02)	(0.02)
Household size	-0.11	-0.01	-0.04
	(0.12)	(0.05)	(0.04)
Members age 0-5	-0.09	-0.11*	-0.10**
	(0.12)	(0.06)	(0.05)
Members age 6-12	-0.06	-0.11*	-0.08*
	(0.12)	(0.06)	(0.04)
Members age 13-18	0.03	-0.01	-0.05
	(0.14)	(0.06)	(0.05)
Members age 19-35	0.17	-0.02	-0.06
	(0.13)	(0.06)	(0.05)
Members age 36-55	0.14	-0.03	-0.01
	(0.11)	(0.06)	(0.05)
Kilometers to food market (logged)	-0.02	0.02	0.04**
	(0.04)	(0.02)	(0.02)
Regional characteristics			
Kaputa	-0.33*	-0.19**	-0.16**
	(0.18)	(0.08)	(0.07)
Shangombo	-0.45***	-0.34***	-0.22***
	(0.12)	(0.07)	(0.07)
N	240	1393	2455

[1]Sample restricted to those who remain in the panel survey in 2012; robust standard errors are clustered at the community level to account for the clustered randomized design and included in parentheses below coefficients. Parameter estimates for vector of baseline prices (maize/grain, rice, beans, fish, oil, sugar, salt, hand soap, liquid soap) not shown. Kalabo district omitted. *** indicates significant differences at the 99% level, ** at the 95% level, and * at the 90% level.

[2]Analysis restricted to those shock groups balanced at baseline along per capita food consumption.

Table 14. The impact of cash on food security amongst households experiencing and avoiding negative income shocks, controlling for the effect of shock covariance[1]

Dependent variable: Severely food insecure (1) – Linear Probability Model				
	No shock either round	*Shock round 1 only*	*Shock round 2 only*	*Shock both rounds*
Constant	1.30***	1.23***	0.85***	1.08***
	(0.28)	(0.18)	(0.13)	(0.13)
Time	-0.08	-0.05	-0.08**	-0.10***
	(0.08)	(0.04)	(0.04)	(0.03)
Cash	0.04	-0.01	0.03	0.01
	(0.07)	(0.05)	(0.03)	(0.04)
Cash*Time	**-0.24****	-0.01	**-0.26*****	**-0.20*****
	(0.10)	(0.06)	(0.04)	(0.04)
Community shock covariance	0.21	**-0.33*****	0.15	**0.14***
(fraction excluding household)	(0.20)	(0.11)	(0.09)	(0.07)
Recipient characteristics				
Age	-0.004	0.002	0.004***	0.0004
	(0.004)	(0.002)	(0.001)	(0.001)
Attended school	0.05	-0.002	-0.004	-0.05**
	(0.07)	(0.04)	(0.02)	(0.02)
Married	-0.03	0.01	-0.05**	-0.03*
	(0.05)	(0.05)	(0.03)	(0.02)
Household characteristics				
Wealth index	-0.04*	-0.04*	-0.04***	-0.04***
	(0.03)	(0.02)	(0.01)	(0.01)
Household size	0.06	0.06	-0.01	-0.01
	(0.09)	(0.04)	(0.04)	(0.03)
Members age 0-5	-0.12	-0.04	0.04	0.06**
	(0.09)	(0.04)	(0.04)	(0.03)
Members age 6-12	-0.04	-0.04	0.02	0.02
	(0.09)	(0.05)	(0.03)	(0.03)
Members age 13-18	-0.09	-0.09*	0.02	0.04
	(0.11)	(0.05)	(0.04)	(0.03)
Members age 19-35	-0.06	-0.08	0.04	-0.01
	(0.09)	(0.06)	(0.04)	(0.03)
Members age 36-55	-0.04	-0.05	0.004	-0.02
	(0.08)	(0.05)	(0.04)	(0.03)
Kilometers to food market	-0.04	-0.01	0.002	-0.01
(logged)	(0.02)	(0.02)	(0.01)	(0.01)
Community characteristics				
Kaputa	0.14	-0.03	0.03	0.01
	(0.11)	(0.07)	(0.04)	(0.04)
Shangombo	-0.04	-0.15*	-0.03	-0.12***
	(0.10)	(0.08)	(0.05)	(0.04)
N	240	428	1385	2445

[1]Sample restricted to those who remain in the panel survey in 2012; robust standard errors are clustered at the community level to account for the clustered randomized design and included in parentheses below coefficients. Parameter estimates for vector of baseline prices (maize/grain, rice, beans, fish, oil, sugar, salt, hand soap, liquid soap) not shown. Kalabo district omitted. *** indicates significant differences at the 99% level, ** at the 95% level, and * at the 90% level.