Can Electronic Transfers Help the Poor? Evidence from a Field Experiment

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Abstract: Conditional and unconditional cash transfers have become an increasingly important component of social protection policies in both developed and developing countries. While such programs are often implemented electronically in developed countries, in many developing countries, cash transfers are distributed manually, resulting in significant costs. The introduction of mobile money transfer systems in many developing countries offers new opportunities for a more cost-effective means of implementing cash transfers, with potential additional benefits for poor rural households, especially those without access to formal financial services. Using data from a field experiment in Niger, we show that distributing cash transfers via mobile transfer systems reduces variable costs to both the implementing agency and program recipients, without affecting leakage. We also find that households receiving cash electronically bought a more diverse set of goods and had higher diet diversity without a reduction in other assets. We explore several mechanisms and find that the results are consistent with a change in intra-household decision-making with respect to the uses of the transfer. These results suggest that providing cash transfers via mobile money systems may have great scope to reduce the costs of implementing such programs while providing additional benefits for rural households.

Keywords: Unconditional cash transfers, mobile money, information technology, intra-household bargaining
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1. Introduction

Conditional and unconditional cash transfers have become an increasingly common component of social protection policies in both developed and developing countries (World Bank 2009, DFID 2011). As of 2010, 52 developing countries had some type of cash transfer program in place (Barrientos, Niño-Zarazúa and Maitrot 2010). While there is widespread evidence of the effectiveness of such programs in improving development outcomes (Baird, Ozler and McIntosh 2011, Schultz 2004, Duflo 2003, among others), the costs of implementing such programs are less frequently studied (Caldes, Coady, and Maluccio 2004). In higher and middle-income countries, such programs are implemented electronically, either via bank transfers or pre-paid debit cards (DFID 2011). Yet in developing countries with limited financial infrastructure, cash transfer programs often require physically distributing cash in small denominations to remote rural areas. This can result in substantial costs for both the implementing agency and program recipients, thereby affecting the potential returns of cash transfers as compared with other anti-poverty programs and resulting in hidden costs to program recipients.

The introduction of mobile phone-based money transfer systems (m-transfers) in many developing countries offers an alternative means of delivering such transfers. By transferring money via the mobile phone, mobile money could potentially reduce the implementation costs associated with providing cash transfers. M-transfer systems may also prove easier for transfer recipients to collect their transfers, provided they have ready access to m-transfer agents. Finally, by bypassing public sector distribution agents and putting money directly into the accounts of beneficiaries, m-transfer systems could potentially lower leakage associated with social protection programs. Yet m-transfers might increase costs for recipients who cannot access m-transfer agents or use the technology, or increase the likelihood of corruption if m-transfer agents can more easily extract the subsidy from program recipients.

Beyond its cost-saving potential, m-transfer systems may have broader implications for economic development (Aker and Mbiti 2010, Jack and Suri forthcoming, Mbiti and Weil 2011). By offering an alternative (and cheaper) means of transferring money, these systems could improve households' access to informal private transfers, thereby allowing them to better manage shocks (Blumenstock, Eagle and Fafchamps 2011, Jack and Suri forthcoming). The more private nature of those transfers could reduce their observability by other households, thereby affecting households' investment decisions (Jakiela and Ozier 2012) or intra-household decision-making (Ashraf 2009). Finally, m-transfer systems may offer a new – and potentially more secure -- savings device, especially for rural households, and increase households' access to formal financial services (Mbiti and Weil 2011).

In this paper, we designed a field experiment in rural Niger in which we randomly varied access to a m-transfer technology in the context of delivering an unconditional cash transfer program. In response to a devastating drought, households in targeted villages received a monthly unconditional cash transfer. The first delivery channel provided the cash transfer manually, whereby cash was distributed in individual envelopes. The second delivery channel provided the cash transfer electronically, whereby program recipients received the transfer via the mobile money transfer system. While m-transfer programs have grown significantly worldwide, mobile money had only recently been introduced in Niger prior to the intervention, and so awareness and usage of the technology was low. As a result, program recipients also received a mobile money-enabled mobile phone. The third delivery mechanism was the same as the manual cash mechanism, but households also received a mobile money-enabled mobile phone. As we were unable to collect data from a pure comparison group prior to the intervention, primarily due to the severity of the crisis, our analysis focuses primarily on the relative impacts of the different technologies in the context of a formal public transfer.

Our main outcomes focus on the costs of the program, the uses of the cash transfer and measures of household well-being. Our primary data are household-level surveys conducted with

1,200 households immediately after the program and seven months' later, as well as data on children's nutritional status collected seven months after the program. We also use weekly price data from 45 markets collected throughout the program period.

Our first main result is that the m-transfer technology reduced the costs associated with delivering the cash transfer program, both for the implementing agency and program recipients. While initial costs of the m-transfer delivery mechanism were higher, primarily due to the fixed costs of mobile phones, variable costs were 1/3 that of the manual cash transfer mechanism. The m-transfer approach also resulted in cost savings for program recipients: the cost to program recipients of obtaining the transfer were ¼ that of the manual cash group, primarily because they traveled shorter distances and waited for shorter periods of time. There was no difference in loss or theft of the cash transfer between the different transfer mechanisms.

Turning to the uses of the transfer, our second main result is that the m-transfer program recipients used the transfer in different ways. Households in the m-transfer group used their cash transfer to buy more diverse types of goods and allocated a greater proportion of their transfer to more diverse foodstuffs, particularly those controlled by women. These diverse uses of the transfer also resulted in improvements in household food consumption, as measured by household and child diet diversity.

We next turn to understanding why the m-transfer mechanism may differ from the impact of receiving a manual cash distribution with a mobile phone. We consider five dimensions: timing and location of the transfer and purchases, access to savings and informal private transfers, mobile phone usage, inter-household sharing and intra-household decision-making. While m-transfer households were less likely to obtain their money on the day of the transfer (seeking it 1-2 days later), we find no evidence that program recipients used the mobile phone as a savings device, changed the frequency or location of their expenditures, were more likely to receive informal private transfers or less likely to share with other households.

Rather, we provide further but somewhat more speculative evidence that the m-transfer technology affected intra-household decision-making with respect to the use of the transfer. The m-transfer mechanism allowed women to temporarily conceal the arrival of the cash transfer from their husbands, enabling them to discuss the uses of the transfer at a more "private" time. This is supported by quantitative evidence: M-transfer program recipients were more likely to travel alone to obtain their cash transfer and m-transfer households spent more money on clothing during Muslim festivals, an area that is traditionally viewed as a male responsibility (Coles and Mack 1991). Moreover, males in m-transfer households were willing to travel farther to *spend* the transfer, often to a market with relatively lower prices. There are two potential explanations for these findings: either the males in m-transfer households were less likely to spend the transfer on "temptation" goods at the market, thereby increasing the amount available for basic foodstuffs; or they were more willing to invest extra effort in finding lower prices for staple foods, thereby allowing the cash transfer to stretch farther. While we cannot entirely rule out the first hypothesis, the results appear to be consistent with the second hypothesis. Our findings are consistent with other studies that suggest that an increase in the female household budget share can increase food and clothing expenditures (Hoddinot and Haddad 1995, Engle 1993, Bobonis 2009), and that privacy can affect the uses of a transfer (Ashraf 2009, Hoel 2012).

Like many field experiments, the generalizability of our results may be limited. Our study exploits variation in the transfer mechanism during a food crisis, when the marginal utility of income can be high. In addition, as we do not have full income and expenditure data, we are unable to estimate the Engel curves of these households, a relevant question for many cash transfer programs (Attansio et al 2012). And finally, since Niger is one of the poorest countries in the world, with low rates of literacy, financial inclusion and mobile money adoption, the context might be different from other countries where governments are considering electronic payments. Nonetheless, Niger's educational, financial and mobile money indicators are not vastly different from other countries in

West Africa, suggesting that our results might be informative for those contexts (UNESCO 2012, Demirguc-Kunt and Klapper 2012).[1]

Though our paper's generalizability has limitations, our paper makes two substantive contributions. First, we contribute to the substantial literature on the effectiveness of cash transfer programs in different contexts, an important policy issue in many developing countries but with more limited evidence in sub-Saharan Africa. While there are several papers documenting the costs of cash transfer programs (Caldes, Coady and Maluccio 2004), to our knowledge, we are the first to document the differential costs, leakage and behavioral responses associated with different distribution mechanisms. And second, our paper adds to a more recent strand of literature on the use of m-transfer systems in the context of shocks (Jack and Suri forthcoming, Blumenstock, Eagle and Fafchamps 2011). That literature has primarily focused on the use of mobile money in response to shocks, thereby making it difficult to disentangle the impact of the mobile phone handset from the impact of the m-transfer technology. In contrast, our paper exogenously varies access to both technologies in the context of an unconditional cash transfer program, thereby allowing us identify differential behavioral responses to each mechanism. In addition, our unique counterfactual reveals the extent to which the use of novel forms of currency is beneficial in the provision of social protection programs. It also suggests that policymakers and researchers may want to more closely document the logistics of payment when designing and evaluating such programs.

The rest of the paper proceeds as follows. Section 2 describes the context in Niger and m-transfer systems. Section 3 describes the experimental design and the underlying theoretical framework. Section 4 describes the different datasets and estimation strategy. We discuss the results in terms of costs (Section 5) and other outcomes (Section 6) before discussing mechanisms (Section 7)

[1]For example, countries in the West Africa region have some of the lowest educational indicators in the world, and fewer than 10 percent of individuals had used mobile money in 2012, ranging from 1-2% in Togo and Ghana to 19% in Liberia (Demirguc-Kunt and Klapper 2012).

and alternative explanations (Section 8). We describe the overall program effects and cost-benefit analyses in Section 9 before we conclude.

2. Background

2.1. Drought and Food Crises in Niger

Niger, a landlocked country located in West Africa, is one of the poorest countries in the world. With a per capita GNP of US$360 and an estimated 85 percent of the population living on less than US$2 per day, Niger is one of the lowest-ranked countries on the United Nations' Human Development Index (UNDP 2011). As the country spans the Saharan, Sahelian and Sudano-Sahelian agro-ecological zones, rainfall ranges from 200 millimeters (mm) per year in the northern regions to 800 mm in the south and is subject to high intra- and inter-annual variability (Nicholson, Some and Kone, 2000). For example, Niger experienced six droughts between 1980 and 2005 (Government of Niger 2007).

A majority of households in Niger depend upon rainfed agriculture, with staple food crops consisting of millet, sorghum and fonio, and cash crops including cowpeas, peanuts, cotton and sesame. Inter-annual deviations in rainfall are positively associated with fluctuations in agricultural output, as yields depend upon the timing and quantity of rainfall.

Because of the correlation between rainfall and agricultural output, drought is positively correlated with food crises and famine. In 2005, an estimated 2.4 million Nigeriens were affected by severe food shortages, with more than 800,000 of these classified as critically food insecure (FEWS NET 2005). Niger also suffered from both drought and harvest failures in 2009/2010, the time period of this study, with 2.7 million people classified as vulnerable to extreme food insecurity (FEWS NET 2010).

2.2. Mobile Money

Mobile phone technology has reduced the costs of communicating information over long distances in many parts of the developing world. This transformation has been particularly dramatic in sub-Saharan Africa, where investments in other infrastructures such as power, roads and landlines are limited. In Niger, there were 13 mobile phone subscribers per 100 people in 2010, as compared to fewer than .2 landline for every 100 people. The road network is equally poor: Despite the fact that Niger is one of the largest countries in Africa, the total road network was estimated to be 15,000 km as of 2005, of which only 8 percent were paved. There is less than 1 bank for every 100,000 people, making it one of the most "unbanked" countries in sub-Saharan Africa (Demirguc-Kunt and Klapper 2012).

Since 2005, m-transfer systems have emerged in 80 developing countries in Africa, Asia and Latin America. These systems typically involve a set of applications that facilitate financial transactions via mobile phone, including paying for bills and transferring money between individuals. Most m-transfer systems allow the user to store value in an account accessible by the handset, convert cash in and out of the account and make transfers by using a set of text messages, menu commands, and personal identification numbers (PINs) (Aker and Mbiti 2010). An "account" can be established by purchasing "electronic money" (e-money) from an agent, usually a third party or someone who works for the mobile phone operator. The user can then send e-money to another recipient with a phone, who then withdraws the money from their local transfer agent. Fees are generally charged for each transaction.

The first m-transfer system in Niger was introduced in January 2010. Known as "Zap", the product was developed by the primary mobile phone service provider (Zain, now Bhartia Airtel). Initial coverage, usage and growth of Zap was limited in 2010 and geographically focused in the

capital city (Niamey) and regional capitals. The cost of making a $USD45 transfer using Zap cost USD$3 during this period.[2]

3. Experimental Design

3.1. Cash Transfer Delivery Mechanisms

In response to the 2009/2010 drought and food crisis in Niger, an international non-governmental organization, Concern Worldwide, designed a short-term social protection program. The program sought to prevent increases in malnutrition and asset depletion by providing unconditional cash transfers to approximately 10,000 drought-affected households during the "hungry season", the five-month period before the harvest.

The first experimental treatment was the *manual cash* intervention (*Cash*), whereby households received an unconditional cash transfer of 22,000 CFA per month (approximately $US45) over a five-month period.[3] The total value of the transfer was slightly less than 2/3 of the total annual GDP per capita, somewhat larger than cash transfer programs in Latin America and sub-Saharan Africa (Handa and Davis 2006, Garcia and Moore 2012).[4] Payments were made on a monthly basis, with cash first counted into individual envelopes and transported via armored vehicles to distribution centers. As is typical in such programs, one village was chosen as a distribution point for a group of 4-5 villages. Program recipients had to travel to their designated location on a given day to receive the cash transfer.[5]

[2]In 2010, it cost $1.50 to make a transfer between $20-$40, whereas a transfer greater than $USD 40 cost $3.
[3]While the program encouraged program recipients to attend health centers, this was not a condition for receiving the actual transfer.
[4]For example, the conditional cash transfer programs in Latin America range from 8-25 percent of average per capita annual income (Handa and Davis 2006). The size of cash transfer programs in sub-Saharan Africa varies considerably, ranging from US$8 per month in Mali to US$37 and US$42 per month in Kenya and Rwanda, respectively (Garcia and Moore 2012). These represent between 20-40 percent of per capita income in those countries. While the objectives for these programs vary considerably, these were for unconditional cash transfer programs that targeted extremely vulnerable households or populations.
[5]Program recipients in *Cash* and *Mobile* villages were informed of the date and location of their cash transfer via a phone call, primarily by contacting a point person within the village the day before or the morning of the transfer.

The two additional interventions were variants of the basic intervention, one of which was aimed at reducing the costs of distributing cash to remote, sparsely-populated and in some cases insecure rural areas. In the second experimental treatment (*Zap*), program recipients received their cash transfer via the mobile phone. After receiving the electronic transfer, recipients had to take the mobile phone to an m-transfer agent located in their village, a nearby village or a nearby market to obtain their cash. As less than 30 percent of households in the region owned mobile phones prior to the program and the m-transfer technology was relatively new to Niger, Concern also provided program recipients with mobile phones equipped with a mobile money account and training on how to use the technology. The transfer charges were paid by Concern. The second intervention thereby differs from the *Cash* intervention with respect to the transfer delivery *mechanism*, as well as the provision of the handset and the m-transfer technology.[6]

In an effort to disentangle the impact of delivery mechanism from that of the mobile phone, we also implemented a third experimental treatment (*Mobile*). The *Mobile* intervention mirrored the manual cash intervention, but program recipients also received a mobile money-enabled mobile phone and training on how to use it.

As these treatments differ in the cash transfer delivery mechanism, as well as the type of technology provided (m-transfer or a mobile phone handset), comparing outcomes under the different treatments will allow us to determine whether the m-transfer technology affected costs and other measures of household well-being. In particular, comparing outcomes between the *Mobile* and *Cash* groups will allow us to measure the additional effect of mobile phone ownership, conditional on the

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While Concern tried to ensure that the cash distribution points were as close as possible to each village, it was not possible to have a distribution point in every village.

[6]While Zap was introduced into Niger in January 2010, there were a limited number of Zap agents in rural areas. Consequently, Concern Worldwide worked with Zain (now Bhartia Airtel) to ensure that Zap agents were registered within the program area. Agents were either registered in the village, in neighboring villages or in nearby markets. On the day of the cash transfer, *Zap* program recipients would receive a special "beep" on their mobile phone, informing them that the transfer had arrived. The program recipient could then travel to a local agent (at her discretion) and show the value on the phone. The m-transfer agent would then remove the value of the cash transfer and "cash out", paying the value of the cash transfer to the program recipient.

manual cash transfer program. Comparing outcomes between the *Zap* and *Mobile* interventions will allow us to detect the additional effect of m-transfer delivery mechanism, conditional on mobile phone ownership and the cash transfer program.

An ideal experiment would have also included a group without access to the cash transfer or mobile phone technology, as well as a group with access to mobile phone handsets and the m-transfer technology (but no cash transfer). Due to the humanitarian nature of the intervention and the political situation at the time of the crisis (a coup occurred in February 2010, two months' prior to the intervention), we were not able to assign villages to or collect data from a comparison group before the program. Hence, while we can estimate the causal effect of the m-transfer delivery mechanism in this context, we are limited in our ability to estimate the impact of the cash transfer program. Nevertheless, we use anthropometric data collected from comparison villages to provide some insights into the overall impact of the cash transfer program in Section 9.

3.2. Targeting and Randomization

We identified 116 villages in one region across five communes of Niger. Eligible villages were those classified by the Government of Niger as having produced less than 50 percent of their consumption needs during the 2009 harvest.[7] Of these, some villages were prioritized for either the *Cash* or *Zap* intervention based upon their lack of mobile phone coverage (*Cash*) and proximity to the Niger-Mali border (*Zap*), thereby reducing our sample size to 96 villages. The remaining eligible villages were stratified by administrative divisions (commune) and then randomly assigned between

[7]To calculate a food "deficit", the Government of Niger estimated village-level millet production and compared this with estimated consumption "needs", defined as 190 kg of millet/capita/year. A village that produced less than 50 percent of its estimated consumption needs was considered to be food deficit, and was therefore eligible for assistance in 2009/2010.

the *Cash*, *Mobile* and *Zap* interventions. In all, 32 villages were assigned to the *Cash* group, 32 to the *Mobile* group and 32 to the *Zap* group.[8]

Within each food deficit village, household-level eligibility was determined by a village-level vulnerability exercise. Using criteria based upon livestock ownership, landholdings and the number of household members, households were classified into four categories (A, B, C and D), with C and D as the poorest categories. Households from the C and D vulnerability categories were selected for the program. The number of recipient households per village ranged from 12 to 90 percent of the village population, covering an average of 45 percent of the population. In all villages, the cash transfer (as well as the mobile phone and training the *Zap* and *mobile* treatments) was provided to the woman. The study timeline is presented in Figure 1.

3.3. Why should mobile money transfers matter?

We expect that the m-transfer delivery mechanism might have potentially differential effects on household behavior and outcomes in five ways. First, by altering the costs involved in obtaining the transfer, the *Zap* program could affect program recipients' time use. If the m-transfer mechanism reduced program recipients' costs involved in obtaining the transfer or reduced uncertainty with respect to these costs, then this would reduce lost income. If, however, the new technology made it more difficult for program recipients to access their cash – either due to the limited number of m-transfer agents, difficulty in using the technology or charging the phone – this could have increased costs for the *Zap* households to obtain the cash transfer program.

Second, as households in *Zap* villages did not have to travel to a pre-arranged location – but could "cash out" from any m-transfer agent – this could have changed households' location and timing of their cash transfer expenditures. For example, *Zap* households could have obtained their cash from an agent (and kiosk-owner) in the village, thereby allowing women greater freedom to spend the cash

[8]The average distance between villages of different treatments was 48 km, with a minimum distance of 3 km. Concern also implemented a seed distribution program in 1/3 of villages.

transfer themselves or enabling access to different types of goods than those available on markets.[9] In addition, the *Zap* transfer technology could have enabled households to store some of the transfer on their phone, thus increasing the "mental costs" associated with unplanned expenditures (Dupas and Robinson, forthcoming).[10]

Third, access to the m-transfer technology could have provided households with an alternative (and less costly) means of receiving money transfers and increased their access to informal private transfers. This could have facilitated households' ability to send or receive transfers outside of the village, particularly from migrants, conditional on the availability of m-transfer services for both parties. Improved access to such transfer mechanisms could thereby help households to better cope with risks and shocks, potentially smoothing consumption (Blumenstock, Eagle and Fafchamps 2011, Jack and Suri forthcoming).

Fourth, access to the mobile phone technology could have reduced households' communication costs with members of their social network. These reduced communication costs could have increased households' access to information about shocks, prices and labor markets information, thereby allowing them to improve their decision-making with respect to agriculture, migration and consumption.

Fifth, since m-transfers reduced the observability of the amount and timing of the cash transfer, this could have affected inter-household sharing, thereby leaving more income available for the household (Jakiela and Ozier 2012). And finally, the transfer mechanism could also have increased women's bargaining power and changed the intra-household allocation of resources (Lundberg,

[9]Since the m-transfer technology was new and involved a training on how to use the technology, *Zap* program recipients could have been better informed about the program, including the time, date and frequency of the cash transfers. This could have enabled households to more efficiently plan their use of the cash transfer.
[10]While the withdrawal fee for the first withdrawal was paid by Concern, program recipients would have had to pay the "cash out" (withdrawal) fee for any additional withdrawals. This would have cost approximately USD$1.50 for each withdrawal.

Pollack and Wales 1997, Duflo and Udry 2004, Doepke and Tertilt 2011), perhaps by reducing observability of the transfer (Ashraf 2009).

4. Data and Estimation Strategy

4.1. Data

This paper uses four primary datasets. The first dataset is a household survey of 1,200 program recipients in 96 intervention villages. In addition, household surveys were conducted with non-eligible households (classified as Category B) from a subset of villages. The primary respondent for the household surveys were program recipients (for participating households) or women with similar characteristics as program recipients (for non-eligible households). The baseline survey was conducted in May 2010, with follow-up surveys in December 2010 and May 2011. The research team located over 94 percent of households for the follow-up surveys. Attrition was not differential across the experimental arms either in December 2010 or May 2011 (Table 11). The main sample in this paper therefore consists of those households who were located during the follow-up surveys and had basic covariate data (1,104 households), although the sample size for each regression depends upon whether a question was relevant for (and therefore answered by) that respondent.

The household survey included modules on household demographics, food security agricultural production and sales, mobile phone usage, asset ownership and shocks. For the follow-up surveys, we also included modules on the uses of the cash transfer. As the surveys were conducted during a humanitarian crisis and over a short time frame, we were mindful of the time burden on respondents. As a result, the household surveys did not include a full income and expenditure module, so we are unable to measure the impact of the program on total household expenditures. Rather, we

collected data on proxies for well-being, such as asset accumulation (as a wealth proxy) and food security measures (including a 24-hour recall for diet diversity).[11]

The second dataset is a village-level survey, collected during the same periods of the household-level surveys. The village surveys collected information from a focus group of male and female village residents on topics such as mobile phone coverage, access to markets and the number of *Zap* agents.

The third dataset includes is weekly price information for six products in forty-five markets between May 2010 and January 2011, as well as the date of each cash transfer in each village. We use these data to test for differential effects of the cash transfer delivery mechanism (*Zap* or *Cash*) on local market prices and supply.

The final dataset is anthropometric data among children under five collected in May 2011. These data were collected in comparison villages and a randomly chosen subset of intervention villages. Comparison villages were selected based upon the similarity of their village-level characteristics with intervention villages, including village population, access to a health center and the village's food deficit status in 2009/2010. Within each comparison village, respondents were chosen based upon a vulnerability exercise similar to that conducted in intervention villages. We use these data to provide some insights into the overall impacts of the cash transfer intervention for cost benefit analyses, recognizing the potential selection bias.

4.2. Pre-Program Balance of Program Recipients

Table 1 suggests that the randomization was successful in creating comparable groups along observable dimensions. Differences in pre-program household characteristics are small and insignificant. Average household size was nine, and a majority of respondents were members of the

[11]The household diet diversity index is a standard index developed by the Food and Nutrition Technical Assistance (FANTA) for surveys in developing countries. It includes a list of twelve food categories, including cereals, tubers, legumes, milk, fish, meat, oils, condiments, fruits, vegetables and sugar. FANTA 2006.

Hausa ethnic group. Average household education was .58 years, and 72 percent of households were in monogamous marriages. Less than thirty percent of households owned a mobile phone prior to the start of the program, yet 63 percent of respondents had used a mobile phone in the few months prior to the baseline. Overall, *Zap* program recipients were older and more likely to be from the Fulani or Touareg ethnic groups as compared with the *Mobile* group. As we would expect ethnicity to play an important role in household consumption and decision-making, particularly with respect to transfers, we control for ethnicity in the regression specifications.[12]

Table 2 provides further evidence of the comparability of the different interventions for key outcomes, namely food security, agricultural production and migration. Household diet diversity was 3 (out of 12 food categories), and households reported having sufficient food for 2 out of the past 6 months. Over 90 percent of households relied upon agriculture as a primary income source, and approximately 50 percent had at least one seasonal migrant in the past year. None of the differences in mean outcomes are statistically significant at conventional levels.

4.3. Estimation Strategy

To estimate the impact of different cash transfer delivery mechanisms on a variety of outcomes, we use a simple reduced form regression specification comparing outcomes in the immediate post period (December 2010), as well as pooled data from the December 2010 and May 2011 rounds. This takes the following form:

$$Y_{iv} = \beta_0 + \beta_1 Zap_v + \beta_2 Mobile_v + X'_{iv0}\gamma + \theta_C + \varepsilon_{iv} \quad (1)$$

The variable Y_{iv} represents the outcome of interest (costs, leakage, uses of the cash transfer, food security and assets) of individual or household i in village v. Zap_v is an indicator variable for whether the village participated in the m-transfer program, whereas $Mobile_v$ is an indicator variable for whether

[12]Overall we made 100 comparisons and found 13 variables that were statistically significant at the 10 percent level, 9 that were statistically significant at the 5 percent level and 1 at the 1 percent level, consistent with what one would expect from random assignment (Barrera-Osario et al 2011).

the village was in the *Mobile* group. θ_C are geographic fixed effects at the commune level, the level of stratification. To improve precision, we include a vector of household baseline covariates, $X'_{iv0,}$ such as ethnicity. Since a seed distribution program was also implemented in a subset of villages, we control for the presence of this program in all specifications.[13] The error term consists of ε_{iv}, which captures unobserved individual or household characteristics or idiosyncratic shocks. We cluster the error term at the village level to account for the program design and correct for heteroskedasticity. The coefficients of interest are β_1 and β_2, which capture the average impact of the two treatments as compared to the basic cash intervention. We also test whether these coefficients are equal. When data are available for two post periods, we pool the data and include a linear time trend variable.[14]

5. Results: Costs and Leakage

A key motivation for using the *Zap* approach in Niger was to reduce the costs of the implementing agency in providing the cash transfer, as well as those of program recipients in obtaining the cash transfer. Figures 2 and 3 show the relative costs to each party.

Figure 2 shows the total costs of each transfer mechanism for Concern Worldwide, including fixed and variable costs, for each month of the program. The primary initial investment costs of the program included expenses for identifying program recipients, purchasing mobile phones and training recipients in using the mobile phones, the latter of which were only for the *Zap* intervention. Variable costs for the manual cash distributions included transport and security costs, as well as costs associated with organizing the cash into individual envelopes.[15] The average per recipient cost was US$12.76 in *Cash* and *Mobile* villages, within the range of per recipient costs for other cash transfer programs in

[13] An ideal experimental design would have also stratified villages according to whether or not they received a seed distribution program, which was impossible. All results are robust to excluding the variable for presence of a seed distribution program, and the presence of a seed distribution program was similar across all interventions (Table 1).
[14] As a robustness check for the outcome measures, we control for the baseline value of the dependent variable in a value-added specification. Results are available upon request.
[15] The key variable costs for the *Zap* intervention included the transfer cost to the program recipients and program recipients' withdrawal fees.

sub-Saharan Africa (DFID 2011).[16] The average per recipient cost in *Zap* villages was US$13.65, or $.90USD more per recipient. Excluding the cost of the mobile phones, the per-recipient cost of the *Zap* intervention falls to $8.80 per recipient. Thus, while the initial fixed costs of the *Zap* program were significantly higher, primarily due to mobile phone purchases, variable costs were 30 percent higher in the manual cash distribution villages, a relevant issue for expanding similar programs. If the cash transfer program had been extended an additional 6 months (one year), the average per-recipient costs would have been relatively equal. The twelve-month period is a relevant comparison for other welfare programs, as a majority of such programs often last at least a year (Barrientos, Niño-Zarazúa and Maitrot, 2010).

Figure 3 shows the recipients' transport and opportunity costs related to obtaining the cash transfer. As both the *Mobile* and *Cash* groups received the cash transfer via the same mechanism, we pool the two groups. Overall, program participants in *Zap* villages incurred significantly fewer costs for obtaining the cash transfer. Whereas *Cash* and *Mobile* program recipients travelled an average of 4.04 km (round-trip) to obtain the transfer, *Zap* program recipients only travelled .9 km to "cash out" at the nearest agent, with a statistically significant difference at the 1 percent level. This is equivalent to a travel time savings of 40 minutes for each cash transfer, or 3.3 hours over the entire program. However, this excludes the program recipients' waiting time during the transfer, which averaged three hours per manual cash transfer.[17] Including wait time, the average cost savings to *Zap* program recipients over the program period would have been 16 hours. Based upon an average daily

[16]The annual per recipient costs of cash transfer programs in sub-Saharan Africa range from US$7 (Malawi) to US$35 (Ethiopia). The annual per recipient cost of this program would have been roughly US$14, less than the program costs in Ethiopia (DFID 2011).
[17]Waiting times for Zap recipients to cash out averaged 30 minutes.

agricultural wage of USD $2.06, this would translate into USD $4.12 over the cash transfer period, or 25 kilograms of millet, enough to feed a family of five for seven days.[18]

In an effort to reduce the likelihood of theft during the manual cash distribution, either at the bank, en route or during the distribution, Concern Worldwide monitored all activities and hired security to guard the cash during its transport. In fact, those costs represented over 60 percent of the manual cash transfer distribution budget. While the *Zap* transfer mechanism outsourced this responsibility to the mobile phone operator and m-transfer agents, thereby reducing costs to the implementing agency, it might have increased the likelihood of loss or theft if the m-transfer agents were able to extract the transfer from program recipients when they went to "cash out". Table 3 shows the impact of the delivery mechanism on different measures of leakage, namely, whether the program recipient received the transfer, the number of transfers received and the total amount of the money received. Overall, leakage was quite low: 99% of manual cash transfer recipients reported receiving their transfer and received over 99,000 CFA (USD $200) over 4.6 transfers.[19] None of these differences were statistically significant across the three treatment arms.

6. Results: Impacts on Outcomes

6.1. Did the Zap Program affect Recipients' Uses of the Transfer?

As the cash transfer was unconditional, program recipients were free to spend the cash transfer how they wished. Overall, households in the manual cash villages used their transfer to purchase 4.40 different categories of goods, including staple grains (99%), cowpeas (42%), dried meat (40%), oil (70%), condiments (70%), health expenses (28%), seeds (20%), school fees (7%), debt reimbursement (7.4%) and labor costs (2%). (Respondents could list more than one use of the cash transfer, so the total can exceed 100%.) Fewer than 1% of households used the cash transfer to buy "temptation

[18]A kilogram of millet costs an average of US$ .17 in Niger, and average household consumption is 3 kg of millet per day.

[19]The cash transfer program provided US $225 over five transfers. As mentioned previously, in those villages where a seed distribution program was offered, seed distributions "replaced" two cash transfers.

goods", defined in this context as food from the kiosks (such as doughnuts and cookies) and tea. Thus, cash transfer recipients primarily used the transfer to ensure immediate consumption needs, but also to make limited agricultural investments and avoid asset depletion.

Table 4 shows the different uses of the cash transfer by intervention group.[20] Overall, the results paint a picture of more diverse uses of the cash transfer by *Zap* households. Households in *Zap* villages purchased .78 more types of food and non-food items as compared with the *Cash* group, and .84 more types of items as compared with the *Mobile* group, with a statistically significant difference between each pair. While the likelihood of purchasing staple grains did not differ by the cash transfer mechanism, program participants in the *Zap* group were 18-19 percentage points more likely to purchase non-staple grains (such as rice and corn), 9 percentage points more likely to purchase cowpea, and 12-18 percentage points more likely to purchase meat, condiments and oil as compared with those in the *Cash* and *Mobile* groups (Panel A). With the exception of cowpeas, all of these differences are statistically significant at the 1 percent level.

Table 4 (Panel B) shows the uses of the cash transfer for non-food items, namely school fees, health expenses and clothing. While relatively fewer households used the transfer for these purposes, there was no difference between the *Zap*, *Mobile* and *Cash* groups. Thus, while the *Zap* program led to more diverse food purchases, it did not lead to differential health or education expenditures, perhaps due to the high marginal utility of income during this period. The patterns are similar when looking at the percentage of program recipients in the village (Table A1) and only for the last transfer (Table A2).

While Table 4 shows the extensive margin of the cash transfer, we might be interested in the intensive margin. Given potential recall error associated with earlier transfer periods, we only

[20]A potential concern with this measure is that program recipients could simply list the first (or largest) expenditures made after receiving the transfer, which could differ by treatment groups. Thus, we might see a treatment effect on measured expenditures rather than actual expenditures. This concern is alleviated by the way in which the question was measured; after program recipients answered the initial categories, enumerators were instructed to go through a comprehensive list of potential categories and ask the recipient if they spent the cash transfer on that particular category.

collected data on the amount spent for the last transfer and for specific categories (i.e. those that were easily able to quantify, such as grains or oils, rather than vegetables, fruits or condiments). The amount of the last cash transfer was USD $40, about 7 percent higher than the average price of a 100-kg bag of millet at the time. Table A3 shows the differential effects of the program on the amounts purchased of specific food items. Almost all *Cash* households (92 percent) purchased a wholesale bag of millet with the cash transfer, representing 80 percent of the value of the monthly transfer. This left approximately USD$8 to purchase other food and non-food items. On average, *Zap* households spent relatively less on the staple grains as compared with both the *Cash* and *Mobile* groups, although there was not a statistically significant difference between the two, perhaps due to the lack of precision.[21] Nevertheless, *Zap* households spent more on other grains (primarily rice) and oil as compared with the *Mobile* and *Cash* groups, consistent with the findings in Table 4.

6.2. Did the Zap Intervention Affect Food Security and Nutritional Status?

While the results in Table 4 suggest that *Zap* households used the cash transfer differently, without a full expenditure module, this would not necessarily indicate a net welfare improvement. Program recipients' spouses could have contributed fewer private and public goods to the household as a result of the cash transfer, so the household's allocation of public and private goods could have remain unchanged. While we are unable to assess the impact of the program on household expenditures, Table 5 attempts to partially address these concerns by estimating the impact of the different cash transfer delivery mechanisms on household food security (measured by diet diversity), child nutritional status and asset ownership.[22]

[21]Some program recipients were unable to answer the questions related to the amount spent on specific food categories, thereby reducing the sample size for these variables to 750 households.

[22]Household diet diversity is defined as the number of different foods or food groups consumed over a given reference period. In this case, the reference period was the past 24 hours. A more varied diet is associated with a number of improved outcomes in areas such as birthweight (Rao et. al., 2001), child anthropometric status (Allen et. al., 1991; Hatloy, Hallund, Diarra and Oshaug, 2000; Onyango, Koski and Tucker, 1998) and food expenditures (Hoddinott and Yohannes 2002, and Thorne-Lyman et al 2010).

The results in Table 5 provide evidence that the more diverse uses of the cash transfer translated into some improvements in household well-being. Households in *Zap* villages had a household diet diversity that was .31 points (10 percent) higher as compared with the *Cash* villages, with a statistically significant difference at the 5 percent level. *Zap* households also consumed .50 more food groups as compared with the *Mobile* group (Panel A), an increase of 16 percent. When assessing the impact on specific food groups, there was no impact of the program on the consumption of staple foods. However, households in *Zap* villages were 6-7 percentage points more likely to consume beans, 9-11 percentage points more likely to consume fats and 3 percentage points more likely to consume fruits than households in *Cash* and *Mobile* villages. All of these differences are statistically significant at the 1 or 5 percent levels. Overall, these effects represent a 30-percent increase in consumption of beans and fats, particularly important food groups given the high prevalence of protein-energy malnutrition in Niger (DHS 2012). Furthermore, this increased household diet diversity is correlated with the more diverse purchases observed in Table 4, thereby suggesting that households used their purchases for household consumption rather than for resale.[23] These results are largely robust to alternative specifications, namely, controlling for baseline outcome measures.

Panel B shows the results of the cash transfer delivery mechanism on child health, as measured by child diet diversity and weight-for-height z-scores (WHZ) for children under 5. These data were collected from a subsample of intervention villages in May 2011, seven months' after the end of the program. Overall, children in *Cash* villages ate 3.16 meals per day, whereas children in *Zap* households ate an additional ¼ meal as compared with those in the *Mobile* and *Cash* groups. These differences are statistically significant at the 5 and 10 percent levels, respectively. Turning to

[23]While *Zap* households purchased more meat with the cash transfer (Table 4), they did not appear to consume more meat (Table 5). This is partially due to the different reference periods for the two tables. For example, Table 4 asked households how they used the cash transfer (the last transfer in October 2010), Table 5 asked about household consumption in the past 24 hours (December 2010). While grains, oils and beans are storable, meat is perishable unless dried. Thus, we would not expect to see an increase in meat consumption two months' after the last cash transfer.

nutritional status, while children in *Zap* villages had higher average WHZ as compared with those in the *Mobile* and *Cash* groups, none of these differences are statistically significant at conventional levels. The same is true with the prevalence of malnutrition, measured as the probability that a child had a WHZ less than -2 s.d.; while overall rates of malnutrition were lower in the *Zap* group, the differences are not statistically significant at conventional levels. This could be partially due to the imprecision of the estimates (as the sample included only 30 villages), as well as relatively low levels of diet diversity in Niger: While improved nutritional status is positively correlated with household diet diversity, this is only the case when diet diversity is significantly greater than 3 food groups (Labadarios et al 2011). Nevertheless, the results in Panel B suggest that the increase in household diet diversity observed in Panel A also benefitted children, and not only adult household members.

Panel C assesses the impact of the program on household asset ownership, using assets as a proxy for household wealth. While asset accumulation would not have been expected during the program, we test for differential impacts in order to verify that other household members were not reducing their contribution to household public or private goods. Excluding mobile phone ownership, *Zap* households owned .16 more asset categories as compared with those in the *Cash* group, and .31 more assets as compared with those in the *Mobile* group, although only the latter comparison is statistically significant at conventional levels. The program did not have an impact upon durable asset ownership (defined as carts, plows, bikes and mopeds). However, there was a marginal increase in non-durable asset ownership: Excluding mobile phone ownership, households in *Zap* villages had .12-.19 more non-durable assets (lamps and flashlights) as compared with the *Mobile* or *Cash* groups, with a statistically significant difference at the 10 and 1 percent levels, respectively. Program recipients did not report purchasing these items with the cash transfer, suggesting that other household members were not reducing their allocation of these goods to the households.

7. Mechanisms

One of the core results in this paper is that receiving a cash transfer via the mobile phone leads to different uses of the transfer and increased household diet diversity, while not necessarily reducing household well-being among other dimensions (namely, asset ownership and nutritional status). These results are due to the m-transfer mechanism, and not the mobile phone. How is this possible? All the *Zap* intervention provided was a different mechanism for receiving the cash transfer. While program recipients' opportunity costs could have been higher during this period, and the reduced time spent obtaining the transfer was significant in the *Zap* households, could this additional "time savings" explain the effects? This section presents evidence on the channels through which the observed impacts occurred, using both household surveys and focus group research. All in all, the data are consistent with the hypothesis that the *Zap* mechanism changed intra-household decision-making with respect to the transfer.

7.1. Did the Zap Intervention Change Timing and Location of Expenditures?

The *Zap* distribution mechanism could have changed program recipients' timing of when they received the transfer, allowing them to save part of the transfer on their mobile phone or spread out expenditures over multiple periods. Alternatively, the m-transfer mechanism could have altered the expenditure patterns of program recipients, allowing them to purchase goods in kiosks closer to home, where the availability and prices of goods could have differed from those in the markets.

Table 6 provides some insights into these mechanisms. While both the *Mobile* and *Cash* households were notified of the arrival of the transfer via a phone call to a village-level contact, *Zap* households were notified by a special "beep" and SMS message that accompanied the transfer. Unsurprisingly, almost all of the *Cash* households received their transfer on the same day that it was available, as most households did not have a choice (Panel A). By contrast, *Zap* households were 66 percentage points less likely to "cash out" on the same day, with a statistically significant difference between the *Zap, Mobile* and *Cash* villages. Using the survey data, a majority of the *Zap* households reported "cashing out" within 1-4 days after learning of the cash transfer. This confirms the actual

cash-out data, which found that a majority of households "cashed out" two days after the transfer was sent.[24]

While there was only a slight difference in the timing of the withdrawal, *Zap* program recipients also had the option of withdrawing the money in smaller amounts, thereby allowing them to use the mobile phone as a savings device to avoid unplanned expenditures. The actual cash out data reveals that this was not the case. For all transfers, over 98% of *Zap* households withdrew the entire amount of their cash transfer at one time (Personal Correspondence with Zain, 2011). This could, in part, be due to the fact that *Zap* households would have had to pay a fee for any additional withdrawals (a cost of approximately $US .25). This is supported by data on the amount saved in program recipients' mobile phone: less than 5 percent of households had any value remaining in their mobile phone, and those that did saved less than US $0.15. This suggests that *Zap* program recipients were not using the *Zap* account as a savings or mental accounting device.

Despite the fact that the *Zap* mechanism did not affect the amount withdrawn, the slight change in the timing of the withdrawal could have modified the timing of household expenditures of the transfer (Panel B). Over 60 percent of manual cash households spent their transfer all at once, 10 percent spent it two times, and the remainder spent it three times (Table 6, Panel B). While this suggests that households spread out their purchases over multiple periods, there was not a statistically significant difference in the timing of purchases between the *Zap, Mobile* and *Cash* groups.

Turning to the location of expenditures, forty-three percent of recipients in the *Cash* villages spent their transfer at a kiosk within the village, whereas sixty-one percent spent the cash transfer at a market outside of the village. While these percentages were relatively higher in *Zap* villages as compared with the *Cash* and *Mobile* villages, there is not a statistically significant difference between the pairs

[24]The lag time between being informed of the transfer and receiving the transfer in *Zap* villages is between 1-2 days longer than the lag time in the *Cash* and *Mobile* villages, who were informed the day before (or day of) the cash transfer.

(Table 6, Panel C).[25] Nevertheless, *Zap* households were willing to travel to markets that were farther afield to spend their cash transfer, an issue we return to in Section 7.5.

7.2. Did the Zap System Increase Households' Access to Private Transfers?

By having access to the m-transfer technology, program recipients in *Zap* villages could have received informal private transfers more easily from migrants, thereby augmenting their income and increasing the diversity of their purchases or diets. Table 7 shows the results of regressions for a variety of indicators related to private money transfers (person-to-person). While households in *Zap* villages were more likely to receive remittances, this did not affect the frequency or amount of remittances transferred to the household. Moreover, households in all villages primarily received remittances via Western Union (34 percent) or friends (53 percent), with less than 1 percent of households receiving remittances via the m-transfer technology (Panel A). This is supported by data on the percentage of program recipients who used *Zap* to make money transfers – very few used the m-transfer technology, and there were no statistically significant differences between the three groups. These results are similar for those households affected by a shock in 2010 or 2011, although the results are less precise due to the smaller sample size (Table 7, Panel B). These results are perhaps not surprising, as the m-transfer system could not be used for transfers outside of the West African currency zone (a destination for most Nigerien migrants) and a majority of respondents were unable to manipulate the mobile money program by themselves (Table A4). This provides evidence that the results are not explained, at least in the short-term, by the impact of the m-transfer technology on private transfers.

7.3. Did the Zap Program Change Mobile Phone Usage?

[25] An alternative explanation is that the "innovation" of the m-transfer technology could have increased program recipients' awareness of the cash transfer program, thereby reducing uncertainty about the cash transfer and allowing households to more optimally allocate expenses over time. Yet only 28 percent of *Cash* program participants could correctly cite the total amount or duration of the cash transfer prior to the program, with no statistically significant difference between the *Zap*, *Cash* and *Mobile* treatments (Table 6, Panel D).

By having access to the mobile phone handset, *Zap* households could have had increased access to information, thereby affecting agricultural practices and diet diversity. Furthermore, the handset could have facilitated communications with migrants and their ability to request remittances via other channels. While in theory this would have yielded similar results in both the *Zap* and *Mobile* groups, in practice *Zap* program recipients could have felt a greater sense of "ownership" of the mobile phones, as the transfer was specifically linked to the handsets.

Table 8 shows the impact of the program on mobile phone ownership and usage for each type of intervention. Unsurprisingly, the *Zap* program increased mobile phone ownership and the frequency of mobile phone usage, with a statistically significant difference between the *Zap* and *Cash* villages (for ownership), as well as between the *Zap*, *Mobile* and *Cash* villages (for usage). While respondents in *Zap* villages were more likely to make calls or send and receive beeps as compared to *Mobile* and *Cash* villages, there was not a statistically significant difference in their probability of receiving a call, writing or receiving SMS or transferring money via the m-transfer system (Panel A). Overall, households in *Zap* villages were more likely to communicate with friends and family members within Niger and to communicate a shock, but there is not a statistically significant difference between the *Zap* and *Mobile* groups (Panel B). Taken together, these results suggest that households in *Zap* villages used the phone in more active ways as compared to those in the *Mobile* and *Cash* groups, but that these operations were primarily associated with the m-transfer operations – such as beeping or receiving a *zap* transfer or SMS. Thus, while we cannot entirely rule out that increased use of the mobile phone handset affected *Zap* households' outcomes in some unforeseen ways, it did not lead to increased incomes via private transfers (Table 7).

7.4. Did the Zap Intervention Change Inter-Household Sharing?

As transfers via the m-transfer system were more difficult for outsiders to observe, this could have changed inter-household sharing within villages, thereby affecting household investment decisions

(Jakiela and Ozier 2012). Table 9 shows the impact of the program on sharing of the transfer and goods purchased from the transfer with different groups within and outside of the village.

Overall, the *Zap* mechanism did not appear to have a strong effect on inter-household sharing. Seventeen percent of *Cash* households shared their cash transfer with another household, whereas 60 percent of *Cash* households shared goods purchased from the cash transfer with another household. While households in Zap villages were more likely to share their cash transfer than those in *cash* villages, there were not other statistically significant differences in sharing across the three treatments. These results suggest that the *Zap* transfer mechanism did not affect the likelihood of inter-household sharing.

7.5. Did the Zap Intervention Change Intra-Household Decision-Making?

Unlike the manual cash mechanism, the *Zap* transfer mechanism made it more difficult for program recipients' spouses to observe the arrival of the transfer, as the program recipient was notified of the transfer arrival via a SMS message and a discrete "beep". In theory, this could have allowed *Zap* program recipients to spend the cash transfers themselves, rather than providing it to their spouses. Yet because the program was implemented an area of Niger where socio-cultural norms do not permit younger, married women of the Hausa ethnic group to travel to markets, either individually or in groups (Coles and Mack 1991)[26], we would not expect to find strong effects of the m-transfer mechanism on women's visible control over the cash transfer.

Nevertheless, the reduced observability of the transfer could have provided program recipients with greater bargaining power with respect to how the cash transfer was used. If this was sufficient to change spouses' spending behavior to focus on more nutritious foods – either by traveling to markets with lower prices or minimizing spending on temptation goods -- then this would be consistent with

[26]This is in contrast to cultural norms in the Fulani and Touareg groups, where women often travel to markets to sell dairy products and purchase food items.

the differential uses of the cash transfer.[27] Qualitative data collected in 12 villages (of all treatment types) suggests that this was the case: Program recipients in *Cash* and *Mobile* villages reported that they immediately provided the cash transfer to their husbands or male family members, with little opportunity to discuss how the transfer was used, since the transfer was observed by all village residents. By contrast, *Zap* program recipients received a discrete beep via their mobile phone when the cash arrived. Since a majority of women carried the phone with them at all times, they were the first notified of the arrival of the transfer. Women reported that they would often notify their husbands in the privacy of their home, allowing them a greater opportunity to discuss how to use the transfer.

Table 10 formally tests for the impact of the *Zap* intervention on a variety of direct and indirect measures of intra-household decision-making.[28] Overall, 52 percent of program recipients in the *Cash* villages reported that they were responsible for spending at least part of the cash transfer, with no statistically significant difference among the three groups (Panel A).[29] Among the remaining households, the transfer was primarily spent by the program recipient's husband or son. Almost all recipients (99 percent) stated that they were consulted on the use of the cash transfer, with no statistically significant difference between the three groups. Yet there was a stark difference in who was responsible for obtaining the transfer: While only 8 percent of *Cash* program recipients travelled alone to obtain their transfer, over 47 percent of Zap households did so, with a statistically significant difference between the *Zap*, *Mobile* and *Cash* households. Furthermore, while *Cash* households

[27]There is a significant literature showing a correlation between increases in female budget shares and increased food expenditures (Hoddinott and Haddad 1995, Engle 1993, Kennedy and Peters 1992).

[28] In order to formally test for differences in intra-household decision-making, we would ideally want to test outcomes across each of the three interventions between households with male and female program recipients. As all program recipients were women, we are unable to do this, and thus can only compare proxy indicators for intra-household decision-making across the three interventions, conditional on the program recipient being a woman.

[29]Program recipients who were primarily responsible for spending the cash transfer were female-headed households (17 percent of the sample) and those of the Fulani and Tuareg ethnic groups, for whom the travel restriction was not a primary constraint. Nevertheless, even in these cases, fewer than 2 percent of these households were solely responsible for spending all of the cash transfer. Other results in Table 10 differ by ethnicity, but the estimates are imprecise.

(primarily husbands or sons) travelled an average of 6 km to spend the transfer, *Zap* households travelled an additional 3 km. In most cases, this was to reach a larger sub-regional market, where average prices for staple foodstuffs were lower.

Panel B assesses the impact of the program on household clothing expenditures, a common dependent variable in much of the female empowerment literature (Deopke and Tertilt 2011, Bobonis 2009, Attanasio and Lechene 2002). The variables focuses on those clothing expenditures for Muslim festivals, the period of the year when households would typically invest in clothing and a key male responsibility in Niger. Households in the *Cash* group spent an average of 38000 CFA (US$70) on clothing during this period. Looking at this by each group, households in *Zap* villages spent 14 percent more on clothing as compared with the cash group, and 17 percent more as compared with the *Mobile* group, with statistically significant differences at the 10 and 5 percent levels, respectively. When looking at clothing expenditures for women, the results are largely similar.[30]

Taken together, the results in Table 10 provide some suggestive evidence of the impact of the *Zap* intervention on intra-household decision-making.[31] There are two ways of explaining these findings: either the males in m-transfer households were less likely to spend the transfer on temptation goods on the market, thereby allowing them to spend the transfer on a more diverse set of food and non-food items; or they were more willing to invest extra effort in finding lower prices for staple foods, thereby allowing the cash transfer to stretch farther. We were unable to survey spouses about their purchases, and so are we are unable to entirely rule out the first hypothesis. Nevertheless, the evidence on the

[30]While much of the literature calculates the ratio of male to female clothing expenditures (Lundberg, Pollak and Wales 1997), very few households spent any money on male clothing during this period, so we concentrate on women's clothing expenditures.

[31]An additional test of the intra-household bargaining channel would be to measure the impacts of the *Zap* program for male and female-headed households. If the program truly changed intra-household bargaining, then the effects should only be apparent for male-headed households. We conduct this heterogeneity analysis and find positive and statistically significant for male-headed households, with no effect for female-headed households. However, we cannot conclude that there is a statistically significant difference between the two groups. This could be partly due to the limited number of female-headed households in our sample (less than 15 percent), as well as the fact that the male and female-headed households are not randomly assigned.

distance travelled (and the destination market) suggests that the latter theory drives the results, and the results on clothing expenditures provide some evidence that women's bargaining power within the household might have shifted.

8. Ruling Out Alternative Explanations

8.1. Attrition

There are several threats to the validity of the above findings. First, the *Zap* intervention could have resulted in differential uptake of the program, thereby affecting the intention to treat estimates. For example, if *Zap* households had more difficulty in finding m-transfer agents or using the technology, they might have been less likely to access the cash transfer. Or, if households in *Zap* villages were more motivated to stay in the program because of the presence of the new technology, then there could have been differential attrition across the three groups. A means comparison of the three groups for each of these outcomes shows that there are no differential effects in attrition, the probability of receiving the cash transfer or shocks across groups (Table 11).

8.2. Differential Access to Zap Agents

The program introduced new infrastructure into the region, primarily by working with the mobile phone operator to register private kiosk-owners and traders as zap agents. While these agents were already village residents, becoming a Zap agent could have enabled them to provide new types of financial or commercial services to households, thereby improving *Zap* households' access to foodstuffs and agricultural inputs. Table 11 shows that this is not the case. Only 3 percent of *Cash* villages had a Zap agent, without a statistically significant difference between the *Zap*, *Mobile* and *Cash* villages. While these results are not very precisely measured, they suggest that Zap agents were evenly distributed across different villages, and that differential access to m-transfer agents is not driving the results.

8.3. Differential Migration

The presence of mobile phone handset could have enabled households to obtain better information about labor markets, thereby resulting in differential effects on seasonal migration (Aker, Ksoll and Clemens 2011). Table A5 shows the effect of the different cash transfer mechanisms on seasonal outmigration. Overall, the probability and intensity of seasonal migration was higher among *Zap* and *Mobile* households as compared to those in the manual cash groups. Nevertheless, there is not a statistically significant difference between the *Zap* and *Mobile* groups, suggesting that the impact is primarily driven by the provision of the mobile phone. As discussed previously, these changes also did not result in increases in the frequency or amount of remittances received over the time period of the study, thereby suggesting that the previous results are not driven by increased informal private transfers.

8.4. Multiple Hypothesis-Testing

In Figure 3 and Tables 4 and 5, we examined the impact of the *Zap* program on 22 different outcomes for three treatment interventions. This raises concerns that the observed effects cannot be attributed to the *Zap* intervention, but are rather simply observed by chance among all of the different outcomes. Following Gibson, McKenzie and Stillman (2011), we use the Bonferroni correction for multiple testing. Using an alpha of 10 percent, and assuming an inter-variable correlation of .08 (for transfer uses) to .35 (for household diet diversity), the Bonferroni p-value would therefore be between .002 and .005.[32] The outcomes that remain significant at these adjusted levels are program recipients' cost of obtaining the cash transfer (Figure 3), the different uses of the cash transfer (Table 4) and some of the household diet diversity indicators in Table 5 (namely, the likelihood of consuming fats). These results are also robust to correcting the p-values using all family of outcomes in Tables 3-12. Thus, we

[32]The Bonferroni correction without accounting for inter-outcome correlation would yield an adjusted p-value of .001. However, in the case of correlated outcome variables, the mean correlation between outcome variables can be included as a parameter in the Bonferroni adjustment (Sankoh et al 1997, Simple Interactive Statistical Analyses). A mean correlation of zero would yield the full Bonferroni adjustment, whereas a mean correlation of one would mean no adjustment.

are confident that the *Zap* intervention affected recipients' costs in obtaining the cash transfer, recipients' use of the transfer and household diet diversity.

8.5. Prices, Market Power and Product Diversity

A final alternative explanation to the interpretation of the above findings is the potential differential effects of the cash transfer mechanism on prices. If the manual cash transfer mechanism put greater inflationary pressure on local markets as compared with the m-transfer mechanism, this could have reduced the value of the cash transfer in those villages and decreased the number of goods purchased or consumed. Or, if the m-transfer increased prices more quickly and producers were price elastic, this could have encouraged households to consume goods that were less affected by the price increase, or increased incentives for traders to supply those goods to the market.[33] Yet Table A6 shows that different cash transfer delivery mechanisms did not have differential impacts on the number of wholesalers and semi-wholesalers on the market, or the number of products available on the market.

Since the intervention occurred at the village level, village-level price data would be optimal for investigating these impacts (Cunha, Di Giorgi and Jayachandran 2011). Yet as over 83 percent of program recipients' purchases in took place in weekly markets – a majority of which are located outside of the village – weekly market price data were collected. The randomized nature of the program implies that some markets were linked to both *Cash* and *Zap* villages, thereby making it difficult to differentiate the impact of each and implying that the stable unit treatment value assumption is almost certainly violated.

Despite these limitations, our analysis treats each market as a local economy and examines food prices as the outcome. Using weekly price data between May and December 2010 from over 45 markets in the region, we estimate the impact of the cash transfer delivery mechanism on weekly prices by using the following regression:

[33]For a discussion of the potential impact of mobile money on the velocity of money and inflation, see Jack, Suri and Townsend (2010).

(2) $$ln(p_{ij,t}) = \alpha + \beta_1 zap_{j,t} + \beta_2 cash_{j,t} + \theta_t + \theta_j + \varepsilon_{ij,t}$$

where $ln(p_{ij,t})$ is the log price of agricultural good i in market j at week t, $zap_{j,t}$ is an indicator variable equal to one if a village within a 10 km-radius of the market received a transfer via zap during week t, 0 otherwise; $cash_{j,t}$ is an indicator variable equal to one if a village within a 10-km radius of the market received a manual cash transfer during week t, 0 otherwise; θ_t represents a full set of time fixed effects, either monthly or weekly, whereas θ_j are a set of market-level fixed effects, which will capture characteristics such as market size, road quality and infrastructure. We also include a variable for the number of villages within a certain radius of the market receiving the cash or zap transfer at that time, as we would expect larger income effects in markets where a higher density of cash transfers took place. To partially account for non-stationarity, we estimate equation (2) via first differences. Standard errors are clustered at the market level. To control for differential price trends across markets during the period of interest, we also include market-specific time trends.

Table 12 presents the results of these regressions, first for any cash transfer and then by the type of cash transfer delivery mechanism. Overall, the presence of a cash transfer in a particular market during the week did not have a statistically significant impact upon food prices (Panel A). The absence of results suggests that local supply on these markets was able to absorb the potential additional demand from the cash transfer program, especially for staple food crops, although this is not a causal interpretation. [34]

Panel B measures the impact the cash transfer delivery mechanism on weekly food prices. Overall, the results are consistent with those in Panel A. The presence of the m-transfer or manual cash transfer program in a nearby village did not have an impact upon staple grain prices (Columns 1, 2 and 3), and there is no statistically significant difference between the two cash transfer mechanisms.

[34]While the results in Table 12 suggest that markets were able to respond to increased demand, these results only show relative changes in prices. Welfare could have decreased on these markets due to the cash transfer if the influx of cash increased prices higher than average prices during this period of year. This requires a comparison of average prices on these markets during the previous (non-drought) marketing season, which we do not have.

The same is true for cowpeas (Columns 4 and 5) and vegetable oil (Column 8). The one difference was for retail rice prices: the presence of a Zap transfer during a particular week increased rice prices by 3 percent, with a statistically significant difference between the zap and manual cash transfer mechanisms. This is consistent with the finding that *Zap* households were more likely to purchase other cereals, primarily rice and corn (Table 4).[35]

As all households were net consumers of local and imported grains during this period, an increase in rice prices would have reduced consumer welfare for recipient and non-recipient households living near those markets affected by the zap transfer.[36] Thus, the price effects suggest that the previous results are a lower bound for the impacts of the zap intervention on recipient households. While the price effects could have also had adverse effects on consumption of non-recipients living in the village and region, overall, the analysis suggests that were not strong price effects due to the program.

9. Impact of the Cash Transfer Program and Cost-Benefit Analysis

A natural question related to the use of a new approach is whether the expected benefits outweigh the additional costs. This is especially the case in most of sub-Saharan Africa, where, despite widespread growth in mobile phone coverage over the past decade, m-transfer systems are still relatively new and have adoption levels below 5 percent.[37] Thus, using a m-transfer system to distribute cash transfers can require significant up-front investments for governmental and non-governmental organizations. It also implies that a network of m-transfer agents already exists in the distribution areas, or can be developed, thereby requiring partnerships with the private sector. In this section, we explore whether a m-transfer program should be a priority for social protection programs by assessing the relative costs and benefits of each approach.

[35]Given the price of a bag of millet, households typically purchased small quantities (e.g., 1 kg) of non-staple grains (such as rice), which could potentially explain the different results on retail and wholesale quantities rice prices.
[36]While the increase in rice prices could potentially increase incentives to produce rice, rice is not produced in this area of Niger.
[37]This excludes Kenya, Tanzania and South Africa.

A full cost-effectiveness analysis of the *Zap* program would require estimates of both the social and private returns to the cash transfer program, as well as a causal estimate of the impact of the cash transfer program. As we do not have data from a randomly assigned comparison group from before the program, we are somewhat constrained in our ability to estimate the impact of the cash transfer intervention. However, using nutritional data from comparison villages collected after the program, we provide some insights into the potential impact of the cash transfer program. While a simple comparison of the cash transfer and comparison villages will be biased, a comparison of time-invariant characteristics suggests that the two groups were similar along most observable dimensions (Table A7).[38]

As outlined in the Figure 2, the average per recipient cost over the life of the project was US$.90 more in *Zap* villages, including the cost of mobile phones. While there was a range of benefits from the *Zap* intervention, we focus on two for the cost-effectiveness analysis: the impact on child nutritional status and child diet diversity. Table 13 shows the results of a regression of child nutritional status (as measured by WHZ) on the presence of any cash transfer program in the village (*Zap, Mobile* or *Cash*), as well as different types of cash transfer mechanisms. Overall, children's WHZ were .08 s.d. higher in the cash transfer villages (Column 1) as compared with the comparison villages. While this effect is not statistically significant at conventional levels, a comparison of the distributions reveals that the distribution of WHZ scores was relative higher in the cash villages, with a statistically significant difference in distributions (Figure 4). The WHZ scores were also relatively higher in each of the cash transfer groups, although without a statistically significant effect (Column

[38]As described in earlier sections, the intervention villages were chosen based upon the Government of Niger's "food deficit list". The government calculations are highly unreliable, due to outdated census data and the timing of the data collection for production statistics (which occurs prior to the actual harvest). As a result, NGOs and donors have often complained that the vulnerability criteria do not reflect actual needs. A comparison of household and village-level time-invariant characteristics collected in control villages in May 2011 suggests that the two groups were largely similar along observable time-invariant dimensions. While we cannot argue that the control villages were randomly assigned, we compare non-eligible households in treatment villages with non-eligible households in control villages to test for potential spillover effects of the program.

2). Nevertheless, the cash transfer program increased child diet diversity by .56 food groups, with a statistically significant difference at the 1 percent level (Column 3). This was almost entirely driven by households in the *Zap* villages (Column 4).

These limited results provide suggestive evidence that the cash transfer program could have improved household well-being, as measured by child diet diversity. These effects were relatively stronger in the *Zap* group, suggesting that the additional costs of the *Zap* intervention yielded an equivalent or higher benefit for *Zap* program recipients. If the program yields benefits in the longer-term, perhaps by allowing households to send and receive more informal transfers or access formal financial services, this could potentially yield a higher rate of return. Nevertheless, in light of potential unobserved differences between the cash transfer and comparison villages, these results on the impacts of the program should be interpreted with caution.

10. Conclusion

Cash transfer programs are an important part of the social protection policies in many developing countries. While there is significant evidence on the impact of such programs on improving specific outcomes, there is more limited evidence on their cost-effectiveness as compared with other types of interventions. Yet understanding the costs of implementing these programs is particularly important in countries where distributing cash involves significant logistical, operational and security costs, as is the case in many countries sub-Saharan Africa.

An intervention that provided a cash transfer via the mobile phone strongly reduced the costs of program recipients in obtaining the cash transfer, and reduced the implementing agency's variable implementation costs. This suggests that mobile telephony could be a simple and low-cost way to deliver cash transfers once the necessary infrastructure is in place. Yet beyond the cost reduction, distributing cash transfers electronically also affected household behavior: *Zap* households bought more types of food items and increased their diet diversity, all while retaining their durable and non-durable assets. These observed differences are primarily due to the m-transfer intervention, and not to

the presence of the mobile phone, suggesting that a program that jointly distributes mobile phones and cash transfers would not yield the same impacts. In addition, these effects are consistent with other evidence suggesting that greater privacy can affect intra-household decision-making.

The m-transfer approach may be limited in its application to all contexts. First, it will only be effective in cases where telecommunications infrastructure currently exists, which could limit its usefulness in remote areas. Second, in areas with high rates of illiteracy, program recipients might not able use the m-transfer technology on their own, implying that they might need help from other family members, friends or m-transfer agents. This could potentially limit the use of the technology by program recipients for informal private transfers, but could be beneficial for the household as a whole.

Despite these caveats, the widespread growth of mobile phone coverage and m-transfer services in developing countries suggests that these constraints could be easily overcome. In addition, the benefits of the program in a context such as Niger -- a country with limited road infrastructure, low literacy rates and high financial exclusion -- suggests that the approach could thrive in less marginalized countries and during periods when the marginal utility of income is lower. This is particularly the case in other areas of West Africa, such as Burkina Faso, Mali, northern Ghana and Senegal, which have similar education and mobile money indicators. Nevertheless, transferring these responsibilities to the private sector could potentially increase the likelihood of corruption or leakage, especially if m-transfer agents exert some type of power vis-à-vis program recipients. In addition, such programs could potentially crowd out certain segments of the private sector, especially smaller traders and shopkeepers who are unable register as agents.

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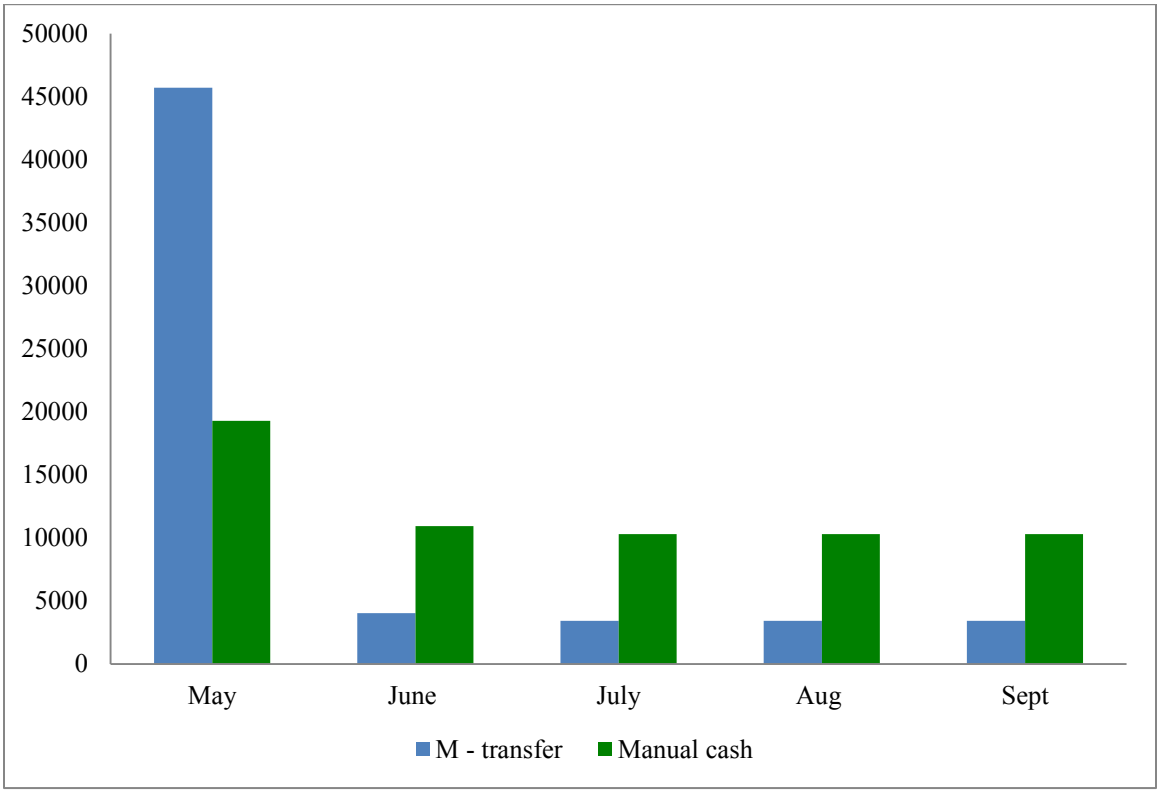
Figure 1. Timeline of Data Collection and Project Implementation

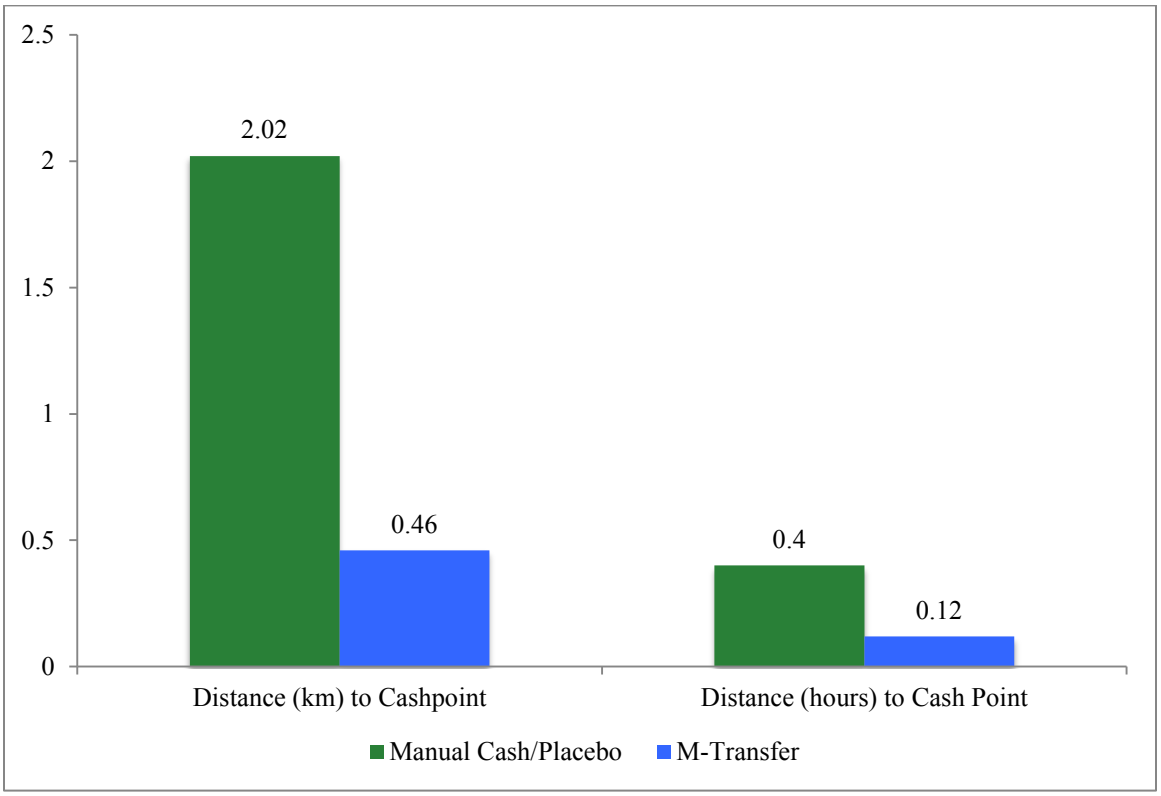
<table>
<tr><th>Year</th><th>January</th><th>March</th><th>April</th><th>May</th><th>June</th><th>July</th><th>August</th><th>September</th><th>October</th><th>November</th><th>December</th></tr>
<tr><td>2010</td><td>Village selection</td><td>Identification and selection of program recipients</td><td>Program preparation</td><td>Baseline household and village-level survey in 96 treatment villages</td><td colspan="4">Hungry season
Monthly cash transfers in 116 villages</td><td colspan="2">Harvest period</td><td>Midterm household and village-level survey in 96 treatment villages</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td colspan="7">Price data collected in 45 markets in all communes</td></tr>
<tr><td>2011</td><td></td><td></td><td></td><td>Final household and village-level survey in 96 treatment villages and 25 control villages</td><td colspan="4">Hungry season</td><td colspan="2">Harvest period</td><td></td></tr>
</table>

Figure 2. Impact of the Cash Transfer Delivery Mechanism on Total Distribution Costs ($ US)



Notes: This figure shows the total costs (in $US) for the manual cash and m-transfer mechanisms for each month of the program. For the m-transfer mechanism, costs include the fixed costs of purchasing the mobile phones, training program recipients in how to use the mobile phones and the variable costs associated with the monthly distribution. For the manual cash mechanism, costs include primarily variable costs associated with manually counting the cash, transport, security and staff time.

Figure 3. Impact of the M-Money Program on **Program Recipients' Costs of Obtaining the Cash Transfer**



Notes: This figure calculates the cost in program recipients distance and hours to the nearest cash point for each cash distribution. Data were obtained from the household surveys and Concern Worldwide's list of distribution points for the manual cash villages.

Figure 4. Impact of the Cash Transfer on Child Nutritional Status

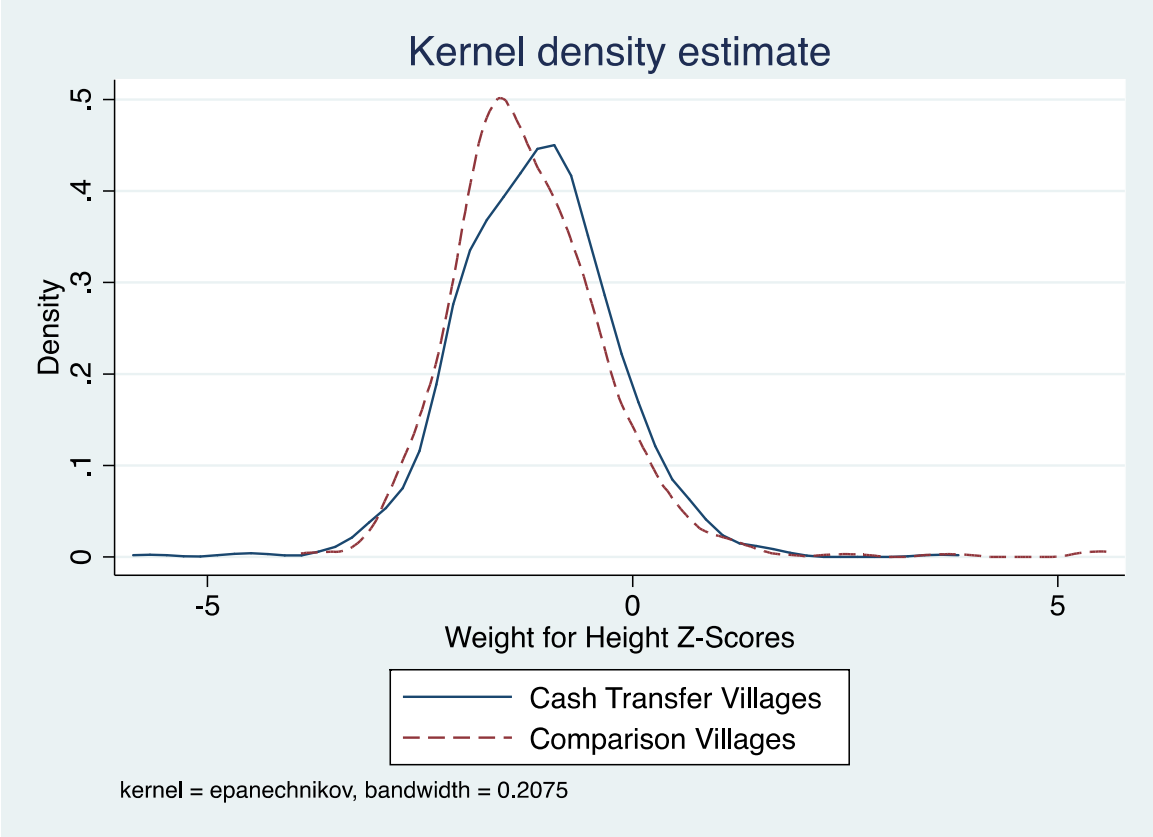


Table 1: Baseline Individual and Household Covariates (by Program Status)

	(1)	(2)	(3)	(4)
	Cash	Zap-Cash	Mobile-Cash	Zap-Mobile
	Mean (s.d.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
Panel A: Socio-Demographic Characteristics				
Age of respondent	33.73	1.78	-1.17	2.95*
	(11.12)	(1.60)	(1.46)	(1.59)
Respondent is household head	0.13	0.05	0.01	0.04
	(0.34)	(0.03)	(0.04)	(0.03)
Polygamous household	0.28	0.02	0.00	0.02
	(0.45)	(0.04)	(0.04)	(0.04)
Respondent is member of Hausa ethnic group	0.82	-0.06	0.08	-0.14*
	(0.39)	(0.08)	(0.07)	(0.08)
Number of household members	9.34	-0.64	-0.40	-0.24
	(4.92)	(0.62)	(0.46)	(0.56)
Number of household members over 15	3.53	0.07	-0.05	0.12
	(2.09)	(0.25)	(0.19)	(0.24)
Average years of household education	0.58	-0.01	0.04	-0.05
	(0.31)	(0.03)	(0.03)	(0.03)
Panel B: Household Income Sources and Assets				
Agriculture is an income source	0.97	-0.02	-0.01	-0.01
	(0.16)	(0.02)	(0.02)	(0.02)
Livestock is an income source	0.62	0.01	-0.08	0.09
	(0.48)	(0.05)	(0.06)	(0.06)
Remittances are an income source	0.35	-0.03	-0.04	0.01
	(0.48)	(0.04)	(0.04)	(0.04)
Number of income source categories	2.46	-0.03	-0.19	0.16
	(1.07)	(0.10)	(0.11)	(0.10)
Number of asset categories	3.59	-0.04	-0.18	0.14
	(1.56)	(0.17)	(0.17)	(0.17)
Panel C: Mobile Phone Ownership and Usage				
Household owns mobile phone	0.29	-0.01	-0.06	0.05
	(0.45)	(0.04)	(0.05)	(0.05)
Respondent is owner of mobile phone	0.25	-0.05	-0.07	0.00
	(0.43)	(0.07)	(0.06)	(0.00)
Respondent has used mobile phone since last harvest	0.63	-0.02	-0.05	0.03
	(0.48)	(0.05)	(0.05)	(0.05)
Used phone to make call since last harvest	0.29	-0.07*	-0.06	-0.01
	(0.45)	(0.04)	(0.05)	(0.05)
Used phone to send or receive m-money transfer	0.01	0.01	0.01	0.01
	(0.00)	(0.01)	(0.01)	(0.01)

Panel D: Shocks				
Household experienced drought in past year	0.99	-0.00	0.01	-0.01
	(0.12)	(0.01)	(0.01)	(0.01)
Household experienced crickets in past year	0.82	-0.06	-0.07	0.01
	(0.27)	(0.05)	(0.05)	(0.05)
Number of observations	1083	1083	1083	1083
Panel E: Village-Level Covariates				
Market located within the village	0.25	-0.04	-0.11	0.08
	(0.44)	(0.10)	(0.09)	(0.09)
Distance to nearest market	7.60	-0.23	1.14	-1.37
	(6.42)	(0.44)	(7.62)	(9.84)
Presence of a seed distribution program	0.28	-0.01	-0.09	0.08
	(0.45)	(0.07)	(0.06)	(0.08)
Number of observations	96	96	96	96

Notes: This table presents a comparison of individual and household covariates in each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (*Cash*) households, whereas Columns 2 and 3 show the average difference between the different treatments and the cash households. Column 4 shows the average difference between the *Zap* and *Mobile* treatment households. All regressions control for commune-level fixed effects and the presence of a seed program in the village. Heteroskedasticity-consistent s.e. are clustered at the village level(for Panels A-C) are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 2: Baseline Individual and Household Outcomes (by Program Status)

	(1)	(2)	(3)	(4)
	Cash	Zap-Cash	Mobile-Cash	Zap-Mobile
	Mean (s.d.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
Panel A: Food Security Outcomes and Coping Strategies				
Number of months of household food provisioning (scale of 6)	1.9	0.12	0.03	0.08
	(1.56)	(0.16)	(0.17)	(0.16)
Household diet diversity index (scale of 12)	3.07	-0.10	-0.31	0.21
	(2.04)	(0.21)	(0.19)	(0.21)
Reduced meals	0.46	0.06	0.10	-0.04
	(0.50)	(0.09)	(0.08)	-0.08
Panel B: Migration and Remittances				
One household member migrated since the last harvest	0.49	0.01	0.01	-0.01
	(0.50)	(0.06)	(0.05)	(0.05)
Number of household members who migrated since last harvest	0.64	0.05	0.06	-0.01
	(0.80)	(0.10)	(0.08)	(0.10)
Number of remittances received	2.11	-0.28	-0.18	-0.09
	(1.27)	-0.17	(0.22)	(0.22)
Received remittance via m-money transfer (zap)	0.05	-0.00	0.01	-0.02
	(0.21)	(0.03)	(0.03)	(0.03)
Panel C: Agricultural Production and Livestock				
Cultivate land	0.98	-0.01	-0.00	-0.01
	(0.13)	(0.01)	(0.01)	(0.01)
Produce millet	0.97	-0.00	0.01	-0.02
	(0.18)	(0.01)	(0.01)	(0.01)
Quantity of millet produced (kg)	269	4.20	-35.42	39.63
	(354)	(48.70)	(46.00)	(44.66)
Produce cowpea	0.87	-0.00	-0.02	0.02
	(0.34)	(0.04)	(0.04)	(0.04)
Quantity of cowpea produced (kg)	10.81	2.03	0.48	1.55
	(32)	(2.87)	(3.19)	(3.51)
Sold millet	0.04	-0.00	0.00	-0.01
	(0.19)	(0.02)	(0.02)	(0.02)
Number of observations	1083	1083	1083	1083

Notes: This table presents a pre-treatment comparison of individual and household outcomes in each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (*Cash*) households, whereas Columns 2 and 3 show the average difference between the different treatments and the cash households. Column 4 shows the average difference between the *Zap* and *Mobile* treatment households. All regressions control for commune-level fixed effects and the presence of a seed program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 3: Leakage

	(1) Cash average	(2) Zap-Cash	(3) Mobile-Cash	(4) Zap-Mobile
Program recipient received cash transfer	0.99	-0.00	0.00	-0.01
	(0.05)	(0.01)	(0.00)	(0.01)
Number of transfers received	4.60	-0.16	-0.17	0.02
	(1.02)	(0.11)	(0.13)	(0.12)
Amount of money received (CFA)	99,254	-868.12	-3,651.53	2,783.41
	(26239)	(2,514.04)	(2,906.76)	(2,579.33)
Number of observations	1043	1043	1043	1043

Notes: This table presents a simple difference comparison of households in each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the average difference between the different treatments and the cash households. Column 4 shows the average difference between the Zap and Mobile treatment households. All regressions control for geographic-level fixed effects and for the presence of a seed distribution program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 4: Uses of the Cash Transfer

	(1) Cash average	(2) Zap-Cash	(3) Mobile-Cash	(4) Zap-Mobile
Panel A: Uses of Cash Transfer for Food Items	Mean (s.d.)	Coeff(s.e.)	Coeff(s.e.)	Coeff(s.e.)
Number of food and non-food items purchased with cash transfer	4.46	0.78***	-0.06	0.84***
	(2.45)	(0.24)	(0.25)	(0.25)
Transfer used to buy staple grains (millet, sorghum)	0.99	-0.01	-0.00	-0.00
	(0.05)	(0.01)	(0.01)	(0.01)
Transfer used to buy other grains (corn, rice)	0.58	0.18***	-0.01	0.19***
	(0.50)	(0.05)	(0.05)	(0.06)
Transfer used to buy cowpea	0.42	0.09*	-0.01	0.10**
	(0.49)	(0.05)	(0.05)	(0.05)
Transfer used to buy condiments	0.69	0.12**	-0.00	0.12***
	(0.46)	(0.05)	(0.04)	(0.04)
Transfer used to buy oil	0.69	0.15***	-0.00	0.15***
	(0.46)	(0.05)	(0.05)	(0.05)
Transfer used to buy meat	0.40	0.16***	-0.02	0.18***
	(0.49)	(0.04)	(0.04)	(0.04)
Panel B: Uses of Cash Transfer for Non-Food Items				
Transfer used to pay school fees	.07	-0.01	-0.01	-0.01
	(0.25)	(0.02)	(0.02)	(0.02)
Transfer used to pay health expenses	.29	0.00	-0.02	0.03
	(0.45)	(0.03)	(0.04)	(0.03)
Transfer used to buy clothes	.04	0.02	0.02	-0.00
	(0.19)	(0.01)	(0.02)	(0.02)
Observations		1104	1104	1104

Notes: This table presents a simple difference comparison of households in each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the average difference between the different treatments and the cash households. Column 4 shows the average difference between the Zap and Mobile treatment households. All regressions control for geographic-level fixed effects and for the presence of a seed distribution program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 5: Impact on Food Security, Nutritional Status and Asset Ownership

	(1)	(2)	(3)	(4)
	Cash average	Zap-Cash	Mobile-Cash	Zap-Mobile
	Mean	Coeff	Coeff	Coeff
	(s.d.)	(s.e.)	(s.e.)	(s.e.)
Panel A: Food Security				
Household diet diversity score (out of 12)	3.14	0.31**	-0.19	0.50***
	(1.69)	(0.16)	(0.13)	(0.14)
Consumption of:				
Grains	0.99	-0.01	-0.01	-0.01
	(0.11)	(0.01)	(0.01)	(0.01)
Beans	0.17	0.07**	0.01	0.06**
	(0.38)	(0.03)	(0.02)	(0.03)
Fats	0.29	0.09***	-0.02	0.11***
	(0.45)	(0.03)	(0.03)	(0.03)
Meat	0.06	0.02	-0.00	0.03*
	(0.24)	(0.02)	(0.02)	(0.01)
Condiments	0.36	-0.00	-0.07*	0.07*
	(0.48)	(0.05)	(0.04)	(0.04)
Fruit	0.03	0.02*	-0.01	0.03***
	(0.16)	(0.01)	(0.01)	(0.01)
Number of observations		2124	2124	2124
Panel B: Child Nutritional Status				
Number of meals eaten by children under 5 in past 24 hours	3.16	0.30**	-0.02	0.24*
	(1.72)	(0.13)	(0.18)	(0.13)
Weight-for-Height Z-score (WHZ)	-1.10	0.04	0.02	0.07
	(0.90)	(0.11)	(0.14)	(0.14)
Prevalence of wasting (WHZ less than -2 s.d.)	0.16	-0.02	-0.05	0.00
	(0.37)	(0.03)	(0.06)	(0.05)
Number of observations		691	691	691
Panel C: Durable and Non-Durable Goods				
Number of asset categories owned (out of 12)	3.03	0.16	0.15	0.31***
	(1.22)	(0.11)	(0.13)	(0.09)
Durable assets	0.16	-0.00	-0.05*	0.05
	(0.45)	(0.04)	(0.03)	(0.03)
Non-durable assets	1.61	0.12*	-0.07	0.19***
	(0.88)	(0.07)	(0.08)	(0.07)
Number of observations		2203	2203	2203

Notes: This table presents the simple difference estimates for each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (cash) households, whereas Columns 2 and 3 show the difference in means between the different treatments and the cash households. Column 4 shows the difference in means for zap and Mobile treatments. All regressions control for commune-level fixed effects and the presence of a seed program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level. Panels A and C include pooled data from the December and May rounds, whereas Panel B only includes data from the May round.

Table 6: Location, Knowledge and Timing of Cash Transfer Expenses

	(1) Cash average	(2) Zap-Cash	(3) Mobile-Cash	(4) Zap-Mobile
Panel A: Timing of Receipt of Transfer				
Obtained transfer the same day	0.89	-0.66***	0.00	-0.66***
	(0.30)	(0.05)	(0.02)	(0.05)
Value (CFA) saved on mobile phone	102	5.44	-39.13	44.58
	(134)	(43.29)	(43.25)	(27.15)
Panel B: Timing of Expenditures				
Spent money all at once	0.61	-0.04	-0.04	-0.00
	(0.49)	(0.04)	(0.05)	(0.04)
Spent money at least two times	0.45	0.03	0.01	0.03
	(0.50)	(0.04)	(0.05)	(0.04)
Spent money more than two times	0.28	0.05	0.03	0.02
	(0.45)	(0.04)	(0.04)	(0.03)
Pane C: Location of Expenditures				
Spent transfer at kiosk in village	0.42	0.04	-0.04	0.08
	(0.49)	(0.06)	(0.05)	(0.06)
Spent transfer at market within village	0.22	0.02	0.06	-0.05
	(0.42)	(0.09)	(0.08)	(0.08)
Spent transfer at market outside village	0.62	-0.00	-0.05	0.04
	(0.49)	(0.09)	(0.08)	(0.08)
Panel D: Knowledge of Cash Transfer				
Knew correct amount of cash transfer	0.28	-0.00	0.00	-0.01
	(0.44)	(0.05)	(0.05)	(0.06)
Knew correct duration of cash transfer	0.26	-0.01	-0.06	0.05
	(0.44)	(0.05)	(0.05)	(0.06)
Number of observations		1021	1021	1021

Notes: This table presents the simple difference estimates for each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (*Cash*) households, whereas Columns 2 and 3 show the difference in means between the different treatments and the cash households. Column 4 shows the difference in means for the *Zap* and *Mobile* treatments. All regressions control for commune-level fixed effects and the presence of a seed program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 7. M-Money and Private Transfers

	(1) Cash average	(2) Zap-Cash	(3) Mobile-Cash	(4) Zap-Mobile
	Mean (s.d.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
Panel A: Full Sample				
Received remittances as income	0.23	0.06	0.00	0.05
	(0.41)	(0.04)	(0.04)	(0.03)
Amount of remittances received for last transfer (CFA)	21156	-537.89	-1,324.95	787.07
	(14618)	(2516)	(2393)	(1761)
Number of remittances since last harvest	2.47	0.28	-0.41	0.69
	(4.94)	(0.65)	(0.53)	(0.45)
Received remittance via Western Union	0.38	-0.05	-0.08	0.03
	(0.48)	(0.07)	(0.05)	(0.06)
Received remittance via friend	0.53	0.04	0.08	-0.04
	(0.50)	(0.08)	(0.06)	(0.07)
Received remittance via Zap	0.01	0.00	-0.00	0.01
	(0.10)	(0.01)	(0.00)	(0.01)
Transferred credit via Zap	0	0.01	0.01	-0.00
	(0.00)	(0.01)	(0.01)	(0.01)
Number of observations	1098	1098	1098	1098
Panel B: Households affected by drought				
Received remittances as income	0.18	0.07	0.05	0.02
	(0.39)	(0.05)	(0.05)	(0.05)
Amount of remittances received for last transfer (CFA)	18887.00	1,854.68	1,348.90	505.78
	(12527)	(2646)	(2521)	(2234)
Number of remittances since last harvest	2.55	0.38	-1.21	1.59**
	(6.48)	(1.02)	(0.79)	(0.66)
Received remittance via Western Union	0.32	0.01	-0.01	0.02
	(0.48)	(0.09)	(0.07)	(0.08)
Received remittance via friend	0.61	0.00	0.06	-0.06
	(0.50)	(0.11)	(0.09)	(0.09)
Received remittance via Zap	0.02	-0.02	-0.01	-0.00
	(0.16)	(0.01)	(0.01)	(0.00)
Transferred credit via Zap	0	0.01	0.01	-0.00
	(0.00)	(0.01)	(0.01)	(0.01)
Number of observations	639	639	639	639

Notes: This table presents the simple difference estimates for each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the difference in means between the different treatments and the cash households. Column 4 shows the difference in means for the Zap and Mobile treatments. While the overall sample size for the first row of Panel A is 1,098 households, the other regressions are conditional on the household having received a remittance, and so are therefore approximately 600 observations. All regressions control for commune-level fixed effects and the presence of a seed program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 8: Impact of Mobile Money on Mobile Phone Ownership and Usage

	(1) Cash average	(2) Zap-Cash	(3) Mobile-Cash	(4) Zap-Mobile
	Mean (s.d.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
Panel A: Mobile Phone Ownership				
Respondent owns a mobile phone	0.23	0.64***	0.54***	0.10
	(0.42)	(0.06)	(0.07)	(0.07)
Used mobile phone since last harvest	0.52	0.32***	0.14***	0.18***
	(0.50)	(0.05)	(0.05)	(0.05)
Made calls	0.26	0.29***	0.21***	0.08
	(0.44)	(0.06)	(0.06)	(0.05)
Wrote or received SMS	0.00	0.01*	0.01	0.00
	(0.00)	(0.01)	(0.01)	(0.01)
Sent or received a "beep"	0.07	0.15***	0.06**	0.08***
	(0.25)	(0.03)	(0.03)	(0.03)
Transferred credit via Zap	0.00	0.01	0.01	-0.00
	(0.00)	(0.01)	(0.01)	(0.01)
Received credit via Zap	0.01	0.97***	0.01	0.95***
	(0.12)	(0.01)	(0.02)	(0.01)
Number of observations	1052	1052	1052	1052
Panel B: Uses of Mobile Phones				
Communicate with family/friends inside Niger	0.39	0.22***	0.14***	0.08*
	(0.49)	(0.06)	(0.05)	(0.05)
Communicate with commercial contacts inside Niger	0.00	0.01	0.02**	-0.01
	(0.00)	(0.01)	(0.01)	(0.01)
Communicate with family/friends outside Niger	0.40	-0.04	-0.05	0.02
	(0.49)	(0.06)	(0.06)	(0.04)
Used mobile phone to communicate death/ceremony	0.14	0.11***	0.11***	0.00
	(0.35)	(0.04)	(0.04)	(0.03)
Used mobile phone to share general information	0.64	0.04	0.01	0.03
	(0.48)	(0.04)	(0.04)	(0.04)
Used mobile phone to ask for help/support	0.14	-0.00	0.03	-0.03
	(0.35)	(0.04)	(0.04)	(0.03)
Number of observations	666	666	666	666

Notes: This table presents the simple difference estimates for each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the difference in means between the different treatments and the cash households. Column 4 shows the difference in means for the Zap and Mobile treatments. All regressions control for commune-level fixed effects and the presence of a seed program in the village. The total sample is 1052, but most regressions have a sample size of 666 observations (conditional on whether the respondent or household had used a mobile phone). Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 9: Impact of Mobile Money on Inter-Household Sharing

	(1) Cash average	(2) Zap-Cash	(3) Mobile-Cash	(4) Zap-Mobile
	Mean (s.d.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
Shared cash transfer	0.17	0.07*	0.03	0.04
	(0.37)	(0.04)	(0.04)	(0.04)
Shared cash transfer with friend or family within village	0.91	0.03	0.03	0.00
	(0.31)	(0.05)	(0.06)	(0.05)
Shared cash transfer with friend or family outside of village	0.02	-0.03	0.02	-0.05
	(0.13)	(0.02)	(0.03)	(0.04)
Shared goods from cash transfer	0.60	-0.01	-0.03	0.02
	(0.49)	(0.04)	(0.04)	(0.05)
Number of observations	1022	1022	1022	1022

Notes: This table presents the simple difference estimates for each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the difference in means between the different treatments and the cash households. Column 4 shows the difference in means for the Zap and Mobile treatments. All regressions control for commune-level fixed effects and the presence of a seed program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 10: Intra-Household Decision-Making

	(1) Cash average	(2) Zap-Cash	(3) Mobile-Cash	(4) Zap-Mobile
	Mean (s.d.)	Coeff(s.e.)	Coeff (s.e.)	Coeff(s.e.)
Panel A: Decision-Making Regarding Cash Transfer				
Respondent responsible for spending cash transfer	0.52	-0.01	-0.02	0.01
	(0.50)	(0.03)	(0.04)	(0.04)
Respondent involved in decision-making of transfer	0.99	0.01	0.01	0.00
	(0.09)	(0.01)	(0.01)	(0.01)
Respondent travelled alone to get transfer	0.08	0.39***	0.03	0.36***
	(0.28)	(0.05)	(0.03)	(0.04)
Distance (km) travelled to purchase items	6.63	2.87*	-0.36	3.23*
	(8.75)	(1.65)	(1.34)	(1.69)
Number of observations	1023	1023	1023	1023
Panel B: Clothing Expenditures for Muslim Festivals				
Log(Household Expenditures on Clothing for Muslim Festivals)	38538	0.15*	-0.05	0.21**
	(39477)	(0.08)	(0.09)	(0.09)
Log(Household Expenditures on Women's Clothing for Muslim Festivals)	14195	0.16*	-0.01	0.18**
	(13878)	(0.09)	(0.09)	(0.08)
Number of observations		794	794	794

Notes: This table presents the simple difference estimates for each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the difference in means between the different treatments and the cash households. Column 4 shows the difference in means for the Zap and Mobile treatments. All regressions control for commune-level fixed effects and the presence of a seed program in the village. The data only include observations from male-headed households. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 11. Alternative Explanations

	(1) Cash average	(2) Zap-Cash	(3) Mobile-Cash	(4) Zap-Mobile
	Mean (s.d.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
Panel A: Attrition and Shocks				
Respondent was present for follow-up survey	0.94	-0.01	0.00	-0.01
	(0.24)	(0.02)	(0.02)	(0.02)
Household was affected by drought in 2010/2011	0.66	-0.01	0.03	-0.04
	(0.47)	(0.05)	(0.05)	(0.05)
Household was affected by illness in 2010/2011	0.74	0.02	-0.01	0.03
	(0.44)	(0.03)	(0.03)	(0.03)
Number of observations	1083	1083	1083	1083
Panel B: Access to Village-Level Infrastructure				
Market located within the village	0.25	-0.04	-0.11	0.08
	(0.44)	(0.10)	(0.09)	(0.09)
Distance to nearest market	7.60	-0.23	1.14	-1.37
	(6.42)	(0.44)	(7.62)	(9.84)
Zap agent in village	0.03	-0.03	0.04	-0.07
	(0.19)	(0.03)	(0.06)	(0.05)
Number of Zap agents in village	0.07	-0.07	-0.00	-0.06
	(0.37)	(0.07)	(0.08)	(0.04)
Number of observations	96	96	96	96

Notes: This table presents the simple difference estimates for each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the difference in means between the different treatments and the cash households. Column 4 shows the difference in means for the Zap and Mobile treatments. All regressions control for commune-level fixed effects and the presence of a seed program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 12: Impact of Cash Transfers on Agricultural Prices

Dependent variable: Log of prices	(1) Millet (tia)	(2) Millet (100-kg bag)	(3) Sorghum (tia)	(4) Cowpea (tia)	(5) Cowpea (60-kg bag)	(6) Rice (1 kg)	(7) Rice (50-kg)	(8) Vegetable Oil (1 liter)
	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
Panel A: Impact of Cash Transfer on Prices								
Any cash transfer	-0.00	0.00	0.01	-0.00	0.02*	0.01	-0.00	-0.01
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Panel B: Impact of Cash Transfer Mechanism on Prices								
Zap	0.00	0.01	0.03	0.00	0.01	0.03**	0.01	-0.01
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)
Cash/Mobile	-0.01	0.00	-0.01	-0.01	0.03*	-0.01	-0.01	-0.01
	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
H_0: Zap-Cash/Mobile								
P-value of F-statistic	0.76	0.30	0.35	0.70	0.16	0.03	0.28	0.29
Mean Price (CFA) of Non-Cash Transfer Markets	516	20,927	466	794	15923	435	19,376	1033
Number of observations	476	412	370	469	343	495	427	459

Notes: Each column shows a separate regression. "Any cash transfer" is a binary variable equal to 1 at time *t* if there was a cash transfer on market *i* during that week, 0 otherwise. "Zap transfer" is equal to 1 in week *t* if there was a zap transfer on market *i* during that week, 0 otherwise. All regressions control for market-specific time trends and week fixed effects. First differences are used to control for non-stationarity. Heteroskedasticity-consistent s.e. clustered at the market-level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 13: Impact of the Cash Program

Dependent variable	(1) Weight for height z-score	(2) Weight for height z-score	(3) Child diet diversity	(4) Child diet diversity
	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
Any cash	0.08		0.56***	
	(0.11)		(0.18)	
Zap		0.16		0.56**
		(0.11)		(0.26)
Mobile		0.14		0.15
		(0.13)		(0.20)
Cash		0.14		0.47*
		(0.11)		(0.25)
Mean of comparison (no cash transfer) group	-1.22	-1.22	2.04	2.04
Additional controls	Yes	Yes	Yes	Yes
Number of observations	758	758	758	758
R-squared	0.02	0.02	0.03	0.04

Notes: This table presents the regression results using May 2011 nutritional data. "Any cash" is a village that received any cash intervention in 2010, 0 otherwise. Zap, Mobile and cash are defined as previously. The comparison group is a village that did not receive any cash intervention in 2010. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table A1: Impact of Zap by Density of Transfer Recipients in Village

Dependent Variable	(1) Use of Transfer	(3) Purchased Other Cereals	(4) Purchased Oil	(5) Purchased Condiments	(6) Purchased Meat	(7) Household Diet Diverity
	Coeff (s.e.)	Coeff (s.e.)	Coeff(s.e.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
Zap*Percentage of Recipients in Village	0.49	0.33	0.08	0.12	0.15	-0.17
	(1.02)	(0.21)	(0.17)	(0.18)	(0.18)	(0.92)
Mobile*Percentage of Recipients in Village	0.32	0.19	-0.16	-0.11	0.08	-1.00
	(1.06)	(0.22)	(0.17)	(0.16)	(0.21)	(0.80)
Zap	0.59	0.05	0.15	0.09	0.10	0.32
	(0.56)	(0.12)	(0.10)	(0.09)	(0.10)	(0.52)
Mobile	-0.08	-0.08	0.10	0.06	-0.05	0.21
	(0.56)	(0.11)	(0.10)	(0.09)	(0.09)	(0.47)
Percentage of Recipients in Village	1.28	0.20	0.33**	0.21	0.04	-0.02
	(0.83)	(0.14)	(0.14)	(0.14)	(0.16)	(0.70)
Number of observations	1,104	1,023	1,024	1,024	1,024	1,134
R-squared	0.12	0.24	0.15	0.12	0.11	0.03
P-value of F-Test:						
*Zap*Percentage of Recipients=Mobile*Percentage of Recipients*	0.88	0.27	0.42	0.43	0.68	.38

Notes: Each column represents a separate regression. All regressions control for commune-level fixed effects and the presence of a seed distribution program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table A2: Impact of the Program on Purchases from Last Cash Transfer

	(1) Cash average Mean (s.d.)	(2) Zap-Cash Coeff(s.e.)	(3) Mobile-Cash Coeff(s.e.)	(4) Zap-Mobile Coeff(s.e.)
Panel A: Uses of Last Cash Transfer for Food Items				
Number of food and non-food items purchased with cash transfer	2.96	0.55***	0.05	0.49**
	(1.92)	(0.19)	(0.18)	(0.20)
Transfer used to buy staple grains (millet, sorghum)	0.92	-0.03	-0.01	-0.03
	(0.27)	(0.02)	(0.02)	(0.02)
Transfer used to buy other grains (corn, rice)	0.38	0.18***	0.01	0.16***
	(0.49)	(0.05)	(0.04)	(0.05)
Transfer used to buy cowpea	0.21	0.08	0.03	0.05
	(0.41)	(0.05)	(0.04)	(0.04)
Transfer used to buy condiments	0.49	0.09**	-0.01	0.10***
	(0.50)	(0.04)	(0.04)	(0.04)
Transfer used to buy oil	0.50	0.12**	-0.03	0.15***
	(0.50)	(0.05)	(0.04)	(0.04)
Transfer used to buy meat	0.19	0.10***	-0.02	0.12***
	(0.39)	(0.04)	(0.03)	(0.03)
Panel B: Uses of Last Cash Transfer for Non-Food Items				
Transfer used to pay school fees	0.15	-0.01	0.00	-0.01
	(0.12)	(0.01)	(0.01)	(0.01)
Transfer used to pay health expenses	0.17	-0.02	0.01	-0.03
	(0.37)	(0.03)	(0.03)	(0.03)
Transfer used to buy clothes	0.02	0.02	0.02	0.00
	(0.15)	(0.01)	(0.02)	(0.02)
Observations	1027	1027	1027	1027

Notes: This table presents a simple difference comparison of households in each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the average difference between the different treatments and the cash households. Column 4 shows the average difference between the Zap and Mobile treatment households. All regressions control for geographic-level fixed effects and for the presence of a seed distribution program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table A3: Impact of the Program on Amount Purchased

	(1) Cash average Mean (s.d.)	(2) Zap-Cash Coeff(s.e.)	(3) Mobile-Cash Coeff(s.e.)	(4) Zap-Mobile Coeff(s.e.)
Amount spent on staple grains (millet, sorghum) in CFA	16081	-492.33	478.55	-970.88
	(5885)	(701.26)	(734.00)	(738.93)
Amount spent on other grains (corn, rice) in CFA	152	67.68**	-0.74	68.42***
	(203)	(26.65)	(24.68)	(25.79)
Amount spent on cowpeas in CFA	123	68.47	35.80	32.67
	(263)	(53.44)	(42.81)	(48.00)
Amount spent on oil in CFA	367	114.23**	-21.98	136.20***
	(425)	(54.41)	(49.92)	(49.94)
Observations	701	701	701	701

Notes: This table presents a simple difference comparison of households in each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the average difference between the different treatments and the cash households. Column 4 shows the average difference between the Zap and Mobile treatment households. All regressions control for geographic-level fixed effects and for the presence of a seed distribution program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table A4: Knowledge of Mobile Phone Commands

	(1) Cash average Mean (s.d.)	(2) Zap-Cash Coeff(s.e.)	(3) Mobile-Cash Coeff(s.e.)	(4) Zap-Mobile Coeff(s.e.)
Respondent can call	0.40	0.16**	0.09	0.07
	(0.49)	(0.07)	(0.07)	(0.05)
Respondent can send SMS	0.03	-0.03**	-0.03*	-0.00
	(0.17)	(0.02)	(0.02)	(0.01)
Respondent can send Zap	0.00	-0.00	0.01	-0.01
	(0.50)	(0.01)	(0.00)	(0.01)
Respondent can recall Zap code	0.00	-0.00	0.00	-0.01
	0.00	(0.01)	(0.00)	(0.01)
Respondent can send airtime	0.04	-0.03	-0.03	0.00
	(0.20)	(0.03)	(0.03)	(0.02)
Observations	498	498	498	498

Notes: This table presents a simple difference comparison of households in each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (Cash) households, whereas Columns 2 and 3 show the average difference between the different treatments and the cash households. Column 4 shows the average difference between the Zap and Mobile treatment households. All regressions control for geographic-level fixed effects and for the presence of a seed distribution program in the village. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table A5: Impact of the Mobile Money on Migration Outcomes

	(1) Cash average	(2) Zap-Cash	(3) Mobile-Cash	(4) Zap-Mobile
	Mean (s.d.)	Coeff (s.e.)	Coeff (s.e.)	Coeff (s.e.)
At least one household member migrates	0.49	0.09**	0.06*	0.02
	(0.50)	(0.03)	(0.04)	(0.02)
Percentage of household members who migrated	0.07	0.03***	0.03***	0.00
	(0.08)	(0.01)	(0.01)	(0.01)

Notes: This table presents the difference in difference estimates for each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (cash) households in the pre-treatment period, whereas Columns 2 and 3 show the DD estimator between the different treatments and the cash households. Column 4 shows the DD estimator for zap and Mobile treatments. Column 5 compares the zap treatment with the joint Mobile/cash treatment. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table A6: Impact of Cash Transfers on Market Dynamics

	(1)	(2)
	Number of traders (=1 if > 5 wholesalers)	Number of products available on market
Dependent variable		
	Coeff (s.e.)	Coeff (s.e.)
Panel A: Impact of Cash Transfer		
Any cash transfer	-0.03	0.06
	(0.05)	(0.04)
Number of observations	480	480
Panel B: Impact of Cash Transfer Mechanism		
Zap	0.05	0.10*
	(0.08)	(0.06)
Cash/Mobile	-0.10	0.01
	(0.07)	(0.05)
H_0: Zap-Cash/Mobile		
P-value of F-statistic	0.22	0.19
Mean of dependent variable for non-cash markets	0.53	3.81
Number of observations	371	475

Notes: Each column shows a separate regression. "Any cash transfer" is a binary variable equal to 1 at time *t* if there was a cash transfer on market *i* during that week, 0 otherwise. "Zap transfer" is equal to 1 in week *t* if there was a zap transfer on market *i* during that week, 0 otherwise. All regressions control for market and week fixed effects. Heteroskedasticity-consistent s.e. clustered at the market-level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table A7. Comparison of Means of Cash and Comparison Villages (May 2011)

Variable	Mean of Any Cash Village	Mean of Comparison Group	Difference in Means
Panel A: Village Characteristics			
Distance to closest health center	14.22	20.63	-6.41 (4.583)
Market in village	0.23	0.00	0.23 (0.13)
Mobile phone coverage in village	1.00	1.00	0.00 (0.00)
Zap agent in village	0.00	0.00	0.00 (0.00)
Agricultural shock in 2010/2011	0.92	0.96	-0.04 (0.03)
Panel B: Socio-demographic Characteristics			
Respondent is married	0.84	0.84	0.00 (.00)
Respondent's ethnicity is Hausa	0.65	0.57	0.08 (.124)
Panel C: Agricultural Production			
Cultivates land	0.99	0.98	0.01 (0.0117)
Household owns land	0.91	0.91	-0.00 (0.0558)
Number of crops produced	4.15	3.80	0.353 (0.301)
Panel D: Shocks			
Household experienced shock since 2010	0.93	0.92	0.01 (0.0228)
Experienced drought since last harvest	0.94	0.82	0.13*** (0.0358)
Experienced death since last harvest	0.06	0.02	0.04 (0.0223)

Notes: This table presents the comparison of means for cash and comparison villages using data from the household and nutrition survey in May 2011