Payment Mechanisms and Antipoverty Programs: Evidence from a Mobile Money Cash Transfer Experiment in Niger

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Conditional and unconditional cash transfers have become an increasingly common component of social protection policies in both developed and developing countries (Fiszbein and Schady 2009; Arnold, Conway, and Greenslade 2011). As of 2013, 119 developing countries had some type of cash transfer program in place (Gentilini, Honorati, and Yemtsov 2014). In higher- and middle-income countries, such programs are often implemented electronically, via either bank transfers or prepaid debit cards. 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 effectiveness of cash transfers as com-

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pared with other antipoverty programs and resulting in hidden costs to program recipients.

The introduction of mobile phone–based money transfer systems (m-transfers, or mobile money) in many developing countries offers an alternative infrastructure for delivering such transfers. By transferring money via the mobile phone, mobile money could potentially reduce the costs and leakage associated with social protection programs.[1] In addition, m-transfer systems may prove easier for recipients to collect their transfers, provided that they have easy access to m-transfer agents (Blumenstock, Callen, and Ghani 2015). Beyond their cost-saving potential, m-transfer systems may have broader implications for economic development by increasing access to informal private transfers (Jack and Suri 2014; Blumenstock, Eagle, and Fafchamps 2016) or serving as an alternative savings device (Mbiti and Weil 2011; Mas and Mayer 2012).

This potential "win-win" scenario, in which the public sector could lower the costs of implementing antipoverty programs and the poor could receive other benefits, is attractive for policy makers, donors, and implementing agencies alike (Banerjee et al. 2013). In 2012, the Better than Cash Alliance was formed, advocating for governmental and nongovernmental organizations to move to digital payments for payroll, government benefits, and humanitarian aid, citing cost savings, transparency, and financial inclusion as potential benefits.[2] This has been echoed by a number of other organizations, such as the Bill and Melinda Gates Foundation, which has made digital payments a key aspect of its financial inclusion strategy.

What is surprising about the calls for a shift to electronic payments is the scarcity of rigorous empirical evidence to support these claims. A priori, it is not clear that electronic transfers will unambiguously improve welfare. For example, much of the proposed cost savings associated with electronic transfers depends on the existence of a well-functioning electronic distribution system, such as a mobile agent network that allows recipients to "cash out." While approximately 271 m-money platforms have been deployed in 93 countries worldwide, adoption has remained low in most countries (Penicaud 2013; Evans and Pirchio 2015).[3] In the absence of physical access points, using m-

[1] Muralidharan, Niehaus, and Sukhtankar (2016) evaluate the impact of distributing cash transfer programs via biometric Smartcards and find that the electronic payment infrastructure reduced leakage.
[2] The Better than Cash Alliance seeks to "empower people through electronic payments." See http://betterthancash.org/about/.
[3] Outside of Kenya, the most notable m-money success story, m-money adoption has remained low in other African countries, estimated at 10% of mobile phone users (Penicaud 2013). This hides substantial geographic variation, with m-money adoption ranging from 19% in West Africa to 55% in East Africa (Penicaud 2013). Nevertheless, not all registered m-money accounts are considered to be active.

money to distribute cash transfers might actually increase costs for recipients who cannot access m-transfer agents or use the technology (MacAuslan 2010).[4] Furthermore, electronic transfers could increase the likelihood of leakage if m-transfer agents can more easily extract the transfer from program recipients than public sector agents.

Using a randomized experiment, we examine the effects of using mobile money in delivering a cash transfer program in Niger. In response to a devastating drought, targeted households in 96 villages received a monthly unconditional cash transfer, with women as the primary beneficiary. The first delivery channel provided the cash transfer manually, whereby cash was distributed in individual envelopes (the standard mechanism). The second delivery channel provided the cash transfer electronically, whereby program recipients received the transfer via the m-transfer system, as well as a m-transfer-enabled mobile phone. The third delivery mechanism was the same as the manual cash mechanism, but households also received a m-transfer-enabled mobile phone. As we were unable to collect data from a pure comparison group, our analysis focuses on the relative costs and benefits of different transfer mechanisms.

Overall, our results provide evidence that the m-transfer system had benefits: households in the m-transfer group used their cash transfer to buy more diverse types of goods and were more likely to purchase protein and energy-rich foods. These diverse uses of the transfer also resulted in a 9%–16% improvement in diet diversity, primarily due to increased consumption of beans and fats, and children consumed an additional one-third of a meal per day. We do not find evidence that m-transfer households reduced their ownership of other durable and nondurable goods, suggesting that other household members were not decreasing their contribution to household goods as a result of the transfer.

These results can be partially explained by less time spent by m-transfer program recipients in obtaining their transfer, as well as increased bargaining power for women. M-transfer program recipients traveled shorter distances to obtain their transfer as compared with their manual cash counterparts.[5] While the magnitude of average time savings was relatively small—approximately

[4] While the number of registered m-money agents has grown substantially over the past few years, maintaining active agents—i.e., those who can cash in and cash out—has remained a challenge for a number of providers (Penicaud 2013).

[5] This result would not be surprising in a context such as Kenya, with over 50,000 mobile money agents (approximately 10% of the total number of agents in sub-Saharan Africa). In West Africa, there are fewer than 45 mobile money agents per 1,000 people in countries such as Senegal and Ivory Coast—two countries with the most well-developed m-money platforms (Lonie et al. 2015). This is lower than the number of Western Union or MoneyGram points of sale in such countries, which are in direct competition with mobile money.

2.5 days over a 5-month period—we believe that this is a conservative lower bound on actual time savings. In addition, this savings occurred during the year when opportunity costs were high, implying that the time savings could have enabled m-transfer program recipients to engage in other productive activities or invest more time in childcare. While we do not have data on the latter channel, we have some evidence in support of the former claim: m-transfer households were more likely to cultivate marginal cash crops that are primarily grown by women.[6]

In addition to the time savings, we provide suggestive evidence that the m-transfer mechanism affected intrahousehold decision making. Program recipients, all of whom were women, reported that the m-transfer was less observable to other household members, thereby allowing them to temporarily conceal the arrival of the transfer. We find that m-transfer program recipients were more likely to travel to weekly markets and spend more on children's clothing than those in the other treatment arms. In addition, the improved diet diversity results were stronger 6 months after the program, well after the cash transfer had been spent. The results, taken together, suggest that the m-transfer technology might have shifted women's bargaining power within the household.

Our article makes two substantive contributions. First, while there has been substantial literature on the costs of transfer programs (Caldes, Coady, and Maluccio 2004; Handa and Davis 2006), there is scant literature on the relative benefits and costs of electronic versus manual transfers. More recently, Muralidharan et al. (2016) have found that electronic transfers combined with biometric identification resulted in significant cost reductions for beneficiaries, whereas Blumenstock et al. (2015) found that mobile salary payments significantly reduced firms' costs in areas where adequate mobile network and agent coverage existed. Second, our experiment adds to a strand of literature on the impact of m-transfer systems on household welfare (Jack and Suri 2014; Blumenstock et al. 2016). That literature has primarily focused on the use of m-money for private transfers. Yet both of these strands of literature are unable to disentangle the impact of the technology from the transfer mechanism. In contrast, our experiment exogenously varies access to both the mobile phone handset and the m-transfer technology, thereby allowing us to identify different behavioral responses to each.

Combined with these studies, our results suggest that the use of technology for antipoverty programs can help to address key logistical challenges in implementing such programs. In our context, the m-transfer intervention also im-

[6] Unlike Muralidharan et al. (2016), we do not find evidence that the m-transfer mechanism had any impacts on leakage.

proved program performance: it greatly reduced program recipients' costs as compared with the manual cash transfer, and variable costs were 20% lower. Yet this requires the existence of an active m-transfer agent infrastructure, which remains a challenge in some of the poorest countries in the world, where such systems could have the greatest potential impact in reducing transaction costs (Penicaud 2013). In addition, it is not clear that such systems will improve households' financial inclusion or generate longer-term benefits, as its proponents suggest. Compared to the manual cash transfer mechanisms, the initial costs of the m-transfer delivery system were higher, primarily due to the costs of mobile phones.

The rest of the article proceeds as follows. Section I describes the context and the experimental design. Section II describes the different data sets and estimation strategy. We discuss the results in Section III before discussing mechanisms (Sec. IV) and alternative explanations (Sec. V). Section VI concludes.

I. Setting and Research Design

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% 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). Rainfall ranges from 200 millimeters per year in the northern regions to 800 millimeters in the south and is subject to high intra- and interannual variability (Nicholson, Some, and Kone 2000). For example, Niger experienced six droughts between 1980 and 2005 (Government of Niger 2007). In 2009–10, the time period of this study, Niger experienced both drought and harvest failures, with 2.7 million people classified as vulnerable to extreme food insecurity (FEWS 2010).

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). Like most m-transfer systems, Zap allowed users 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 (Aker and Mbiti 2010). While mobile phone coverage has grown substantially in Niger over the past decade, initial coverage, usage, and growth of Zap was limited and geographically focused in the capital city (Niamey) and regional capitals.[7] Making a US$45 transfer using Zap cost US$3 during this period.[8]

[7] Since the introduction of m-money into Niger in 2010, there have been three m-money deployments. Nevertheless, m-money adoption in Niger is still estimated at 5%.

[8] In 2010, it cost US$1.50 to make a transfer between US$20 and US$40, whereas a transfer greater than US$40 cost US$3.

A. Cash Transfer Delivery Mechanisms

In response to the 2009–10 drought and food crisis in Niger, an international nongovernmental 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 5-month period before the harvest.

The first experimental treatment was the manual cash intervention (*Cash*), whereby households received an unconditional cash transfer of CFA 22,000 per month (approximately US$45) over a 5-month period.[9] The total value of the transfer was slightly less than two-thirds of the total annual GDP per capita, larger than cash transfer programs in Latin America and sub-Saharan Africa (Handa and Davis 2006; Garcia and Moore 2012).[10] Payments were made on a monthly basis, with cash counted into individual envelopes and transported via armored vehicles to distribution centers.[11] As is common in these types of programs in Niger, one village was chosen as a distribution point for a group of villages, although Concern tried to ensure that the cash distribution points were as close as possible to each village (Niang, Mistycki, and Fall 2012; Hoddinott, Sandstrom, and Upton 2014). Program recipients 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, and had to travel to their designated location on that given day to receive the cash transfer. The manual cash transfer system was similar to that of other antipoverty programs in Niger at the time.

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

[9] The value of the transfer varied monthly, with three initial transfers of CFA 20,000 (US$40) and two final transfers of CFA 25,000 (US$50).

[10] Conditional cash transfer programs in Latin America range from 8% to 25% of average per capita annual income (Handa and Davis 2006). The size of unconditional 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% and 40% of per capita income in those countries. The program was the same magnitude as the government's safety net program, which provided CFA 10,000 per month over 12 months, although the timing was concentrated during the hungry season.

[11] Despite the fact that Niger is one of the largest countries in Africa, the total road network was estimated to be 15,000 kilometers as of 2005, of which only 8% was paved. There is less than one bank for every 100,000 people, making it one of the most "unbanked" countries in sub-Saharan Africa (Demirguc-Kunt and Klapper 2012).

via the mobile phone. On the day of the cash transfer, Zap program recipients would receive a message with a special "beep" on their mobile phone, informing them that the transfer had arrived. After receiving this notification, program recipients had to take the mobile phone to a m-transfer agent located in their village or a nearby village to obtain their transfer.[12] 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. As less than 30% of households in the region owned mobile phones before the program, Concern also provided program recipients with mobile phones equipped with a m-money account and training on how to use the technology. In addition, as Zap was introduced into Niger a few months before the intervention, there were a limited number of Zap agents in rural areas. Concern therefore encouraged the mobile phone operator to register m-money agents within the program area but did not have any control over the location or density of those agents. The second intervention thereby differed from the Cash intervention with respect to the transfer delivery mechanism, as well as the provision of the handset and the m-transfer technology.

In an effort to disentangle the impact of the electronic 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 type of delivery mechanism and technology provided (m-transfer or a mobile phone), comparing outcomes across the different treatments will allow us to estimate the additional costs and benefits of using the m-transfer technology in the context of a social protection program. In particular, comparing outcomes between the Mobile and Cash groups allows us to measure the additional effect of mobile phone ownership, whereas comparing outcomes between the Zap and Mobile interventions allows us to estimate the additional effect of the m-transfer delivery mechanism.[13]

Because of the humanitarian nature of the intervention and the political situation at the time, we were unable to collect data from a pure comparison group. Hence, while we can estimate the causal effect of the m-transfer mech-

[12] While the transfer fee and the first withdrawal fee were paid by Concern, program recipients would have had to pay the "cash out" (withdrawal) fee for any additional withdrawals. This would have cost approximately US$0.25 for each withdrawal.

[13] Concern also implemented a seed distribution program in approximately one-third of targeted villages, whereby recipient households could replace two of their cash transfer payments with the equivalent value in seeds (also provided by Concern). There is not a statistically significant difference in the presence of a seed distribution program across treatments (table 2).

anism as compared with the manual cash mechanism, we cannot estimate the causal impact of the cash transfer program.

B. Experimental Design

Prior to the intervention, Concern Worldwide identified 116 intervention villages in one region of Niger. Eligible villages were those classified by the government of Niger as having produced less than 50% of their consumption needs during the 2009 harvest.[14] Of these, some villages were prioritized for either the Cash or Zap intervention on the basis of their lack of mobile phone coverage (Cash) and proximity to the Niger-Mali border (Zap), thereby reducing our sample size to 96 eligible villages. Among these villages, we first stratified by administrative division (commune) and then randomly assigned villages to the Cash, Mobile, or Zap interventions. In all, 32 villages were assigned to the Cash group, 32 to the Mobile group, and 32 to the Zap group.[15]

Before program assignment, eligible households within each village were identified by a village-level vulnerability exercise. Using indicators such as livestock ownership, landholdings, and the number of household members, households were classified into four vulnerability categories (A, B, C, and D), with C and D as the most vulnerable categories. Households from the C and D categories were selected for the program. The number of recipient households per village ranged from 12% to 90% of the village population, covering an average of 45% of the population. In all treatments, the cash transfer (as well as the mobile phone and training in the Zap and Mobile treatments) was provided to the woman within the household.[16] The study timeline is presented in table 1.

C. Why Should M-Transfers Matter?

We expect that the m-transfer delivery mechanism might affect household outcomes through different channels. First, if the m-transfer mechanism reduces

[14] To calculate a food "deficit," the government of Niger estimated village-level millet production and compared this with estimated consumption "needs," defined as 190 kilograms of millet/capita/year. A village that produced less than 50% of its estimated consumption needs was considered to be in a food deficit and was therefore eligible for assistance in 2009–10.

[15] The average distance between villages of different treatments was 48 kilometers, with a minimum distance of 3 kilometers.

[16] Concern Worldwide distributed the cash transfer in the Cash and Mobile treatments to the female program recipient only (after presenting the beneficiary ID card), unless the program recipient had a disability. The requirement was the same for the Zap treatment group: m-money agents were instructed to only cash out to the intended program recipient, upon presentation of the mobile phone, personal identification number, and beneficiary ID card. If there were multiple wives within a household (28% of households), the transfer was provided to the first wife.

TABLE 1

TIMELINE OF DATA COLLECTION AND IMPLEMENTATION

Year	January	March	April	May	June July August September	October November	December
2010	Village selection	Identification and selection of program recipients	Program preparation	Baseline household and village-level survey in 93 villages	Hungry season and planting season monthly cash transfers in 116 villages	Harvest period	Midterm household and village-level survey in 96 treatment villages
					Price data collected in 45 markets in all communes		
2011				Final household and village-level survey in 96 villages; nutrition survey in 30 villages	Hungry season and planting season	Harvest period	

program recipients' costs involved in obtaining the transfer or their uncertainty with respect to these costs, then this could reduce program recipients' opportunity costs during a time of year when such costs were relatively higher. Alternatively, if the new technology makes it more difficult for program recipients to access their cash—either because of the limited number of m-transfer agents or difficulty in using the technology or charging the phone—this could increase costs for the Zap households to obtain the cash transfer program. Furthermore, while we might expect such transfers to reduce leakage (Muralidharan et al. 2016), electronic transfers could increase the likelihood of leakage if m-transfer agents can more easily extract the transfer from program recipients.

Second, the m-transfer system could simply change the way in which households spend the cash transfer. For example, if Zap program recipients obtain their cash from an agent and kiosk owner within the village, program recipients might be exposed to different products or prices at the kiosk. The m-transfer technology could also encourage program recipients to store some of the transfer on their phone, thus increasing the mental costs associated with unplanned expenditures (Dupas and Robinson 2013).

Third, access to the mobile phone technology could increase households' access to information, thereby allowing them to improve their decision making with respect to agriculture, migration, and consumption. Since program recipients in both the Zap and Mobile treatments received mobile phones, this should only be a potential channel if Zap households used their handsets in different ways or if women had greater control of the phone. In particular, having access to the m-transfer technology on the mobile phone could have provided an alternative means of receiving informal private transfers, thereby helping households to better cope with risks and shocks (Jack and Suri 2014; Blumenstock et al. 2016).

Finally, since m-transfers reduce the observability of the amount and timing of the cash transfer, this could affect women's bargaining power within the household, thus changing the intrahousehold allocation of resources (Duflo and Udry 2004; Doss 2006; Ashraf 2009; Morawczynski and Pickens 2009; Ashraf, Field, and Lee 2014; Doepke and Tertilt 2014).[17] Reducing the transfer's observability could also affect interhousehold sharing, thereby leaving more income available for the household (Jakiela and Ozier 2016).

[17] Ashraf et al. (2014) provide a voucher for concealable contraceptives either to women alone or jointly with their husbands and find that women who were privately provided a voucher were more likely to use the contraceptives and have fewer births.

II. Data and Estimation Strategy

A. Data

This article uses four primary data sets. The first data set is a household survey of 1,152 program recipients in 96 intervention villages across three rounds. The primary respondent for the household surveys was the program recipient for participating households. The baseline survey was conducted in May 2010, with follow-up surveys in December 2010 and May 2011. The research team located approximately 93% of respondents for the follow-up surveys, and attrition was not differential across the experimental arms either in December 2010 or May 2011 (table A1; tables A1–A7 available online). The main sample in this article therefore consists of those households that were located during the follow-up surveys: 1,082 respondents.[18]

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 food 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.

The second data set is a village-level survey, collected during the same periods as 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 data set includes weekly price information for six products in 45 markets between May 2010 and January 2011, as well as the date of each cash transfer in the village. We use these data to test for differential effects of the cash transfer delivery mechanism on local market prices and supply.

The final data set is anthropometric data among children under 5, collected in May 2011. These data were collected from program recipient households

[18] The number of observations in each table is not always equal to 1,082. First, if the survey team was not able to find the respondent but found another household member, then the team interviewed the other household member, asking household-specific (not respondent-specific) questions. Second, sections that are related to the uses of the transfer (e.g., tables 4, 6, and 7) are conditional on the household having received a transfer, which is approximately 1,047 households. Finally, there are some missing observations for specific variables, and some tables include several rounds of data. Thus, the number of observations in the table is the maximum number of observations for a set of dependent variables.

from a randomly chosen subset of intervention villages, for a total sample of 30 villages and 691 households.

B. Preprogram Balance of Program Recipients

Tables 2 and 3 present the baseline characteristics for the sample.[19] Column 1 presents the sample mean and standard deviation for a series of characteristics. To test for balance across groups, columns 2–3 present the coefficient estimates and standard errors of the difference between the baseline mean in the Zap or Mobile treatments and the mean in the Cash treatment. Since randomization was done at the village level, the standard errors are clustered at the village level. In addition, controls for the presence of the seed program and stratification fixed effects are included.

A few characteristics are worth mentioning. The average household size was nine, and a majority of respondents were members of the Hausa ethnic group (table 2). Twenty-eight percent of households were in polygamous marriages. Only 29% of households owned a mobile phone before the start of the program, yet 61% of respondents had used a mobile phone in the few months before the baseline. Ninety-eight percent of households had experienced drought in the past year. Thirty-five percent of villages had a weekly market, and 26% had a seed distribution program.

Turning to key outcome variables (table 3), household diet diversity was 3 (out of 12 food categories), and households reported having sufficient food for approximately 2 out of the past 6 months. This is unsurprising, as 97% of households relied on agriculture as a primary income source, and nearly all of them had been affected by drought.

Looking at the differences across treatments, the randomization appears to have been successful in creating comparable groups along observable dimensions. Differences in preprogram household characteristics and outcomes are small and generally not statistically significant. Zap program recipients were older, less likely to be from the Hausa ethnic group, and more likely to raise livestock as compared with the Mobile group (panels A–D).[20] Overall, there are 30 dependent variables in tables 2 and 3. Of these, only two coefficients

[19] Because of an administrative error, the survey team only conducted the baseline survey in 93 villages (rather than 96). Thus, the total number of baseline observations should be 1,106, rather than 1,152; however, there are missing baseline observations for some variables.

[20] In this context, the differences in ethnicity and livestock-raising are correlated, as the Fulani and Touareg ethnic groups are primarily pastoralists.

were statistically significant at the 10% level and 1 coefficient at the 5% level, comparable with what we would expect with random assignment.

C. 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 of the following form:

$$Y_{iv} = \beta_0 + \beta_1 \text{Zap}_v + \beta_2 \text{Mobile}_v + \mathbf{X}'_{iv0}\gamma + \text{seed}_v + \theta_C + \varepsilon_{iv}, \quad (1)$$

where Y_{iv} represents the outcome of interest (costs, uses of the cash transfer, food security, and assets) of individual or household i in village v after the transfer, Zap_v is an indicator variable for whether the village was assigned to the m-transfer program, whereas Mobile_v is an indicator variable for whether the village was assigned to the Mobile group, and θ_C are geographic fixed effects at the commune level, the level of stratification. As a robustness check, we also include a vector of covariates that differed at baseline, $\mathbf{X}'_{iv0}$, such as age.[21] Finally, we control for the presence of a seed distribution program at the village level. 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 also correct for heteroskedasticity. The coefficients of interest are β_1 and β_2, the intent-to-treat effect of the different transfer mechanisms (as compared with the basic cash intervention) on the outcome of interest, under the assumption that they are conditionally orthogonal to ε_{iv}. Most regression specifications presented in this article use the December 2010 household data, immediately after the transfer. When household data are available for both December 2010 and May 2011, we pool the data and include a linear time trend. We also conduct separate analyses by time period, which allows us to measure the immediate and longer-term effects of the program.

Equation (1) is our preferred specification for most outcomes, as some of the data were not collected during the baseline. For those outcomes for which baseline data are available, we also use an analysis of covariance (ANCOVA) specification, which controls for baseline value of the outcome variable. When an outcome variable has high variability and low autocorrelation, as is the case with our food security measures, the ANCOVA model is preferred over difference in differences (McKenzie 2012).

[21] The results presented in the tables do not include baseline covariates. Results are largely robust to including covariates that differed at baseline (age, livestock raising, and growing cowpeas), although the individual coefficients and levels of statistical significance may vary slightly.

TABLE 2

BASELINE INDIVIDUAL AND HOUSEHOLD COVARIATES (BY TREATMENT STATUS)

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Sociodemographic characteristic			
Age of respondent	33.22	1.90	−.90	2.79**
	(11.05)	(1.21)	(1.24)	(1.24)
Polygamous household	.28	.04	.02	.01
	(.45)	(.04)	(.04)	(.04)
Respondent is member of Hausa ethnic group	.81	−.05	.08	−.13
	(.39)	(.08)	(.06)	(.08)
Number of household members	9.30	−.40	−.21	−.18
	(4.95)	(.63)	(.52)	(.50)
Number of household members under 15 years	5.65	−.35	−.11	−.24
	(3.42)	(.38)	(.34)	(.34)
Percentage of household members with some education	.58	−.01	.04	−.04
	(.32)	(.03)	(.03)	(.03)
	B. Household income sources and assets			
Agriculture is an income source	.98	−.01	−.01	−.00
	(.15)	(.01)	(.01)	(.01)
Livestock is an income source	.61	.06	−.03	.09*
	(.49)	(.06)	(.06)	(.05)
Remittances are an income source	.34	−.01	−.05	.04
	(.47)	(.04)	(.04)	(.04)
Number of asset categories owned (out of 12)	3.62	.07	−.15	.22
	(1.60)	(.18)	(.16)	(.14)
	C. Mobile phone ownership and usage			
Household owns mobile phone	.29	.04	−.03	.06
	(.45)	(.05)	(.04)	(.04)
Respondent has used mobile phone since last harvest	.61	.06	.00	.05
	(.49)	(.05)	(.05)	(.04)
Respondent made or received call since last harvest	.61	.06	−.00	.05
	.49	(.05)	(.05)	(.04)
Respondent sent or received m-money transfer since last harvest	.00	.00	.00	−.00
	(.00)	(.00)	(.00)	(.00)
	D. Shock			
Household experienced drought in past year	.98	−.00	.01	−.01
	(.15)	(.01)	(.01)	(.01)
Household experienced crickets in past year	.81	−.02	−.04	.01
	(.39)	(.04)	(.05)	(.05)
Number of household observations	1,106			

TABLE 2 (*Continued*)

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	E. Village-level covariate			
Market located within the village	.35	−.04	.01	−.04
	(.49)	(.13)	(.13)	(.12)
School located within village	.97	.01	−.04	.05
	(.18)	(.04)	(.05)	(.05)
Presence of a seed distribution program	.26	.04	−.04	.08
	(.44)	(.08)	(.08)	(.09)
Number of village observations	93			

Note. Comparison of individual and household covariates in each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 2 and 3 show the difference in conditional means between the different treatments and the Cash households. Column 4 shows the conditional difference in means 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—the level of stratification before randomization. Heteroskedasticity-consistent SEs clustered at the village level (for panels A–C) are in parentheses.

* Significant at the 10% level.

** Significant at the 5% level.

III. Results

A. Uses of the Transfer

As the cash transfer was unconditional, program recipients were free to spend it how they wished. Overall, households in the manual cash villages used their transfer to purchase 4.32 different categories of goods and services, including staple grains (99%), oil (68%), condiments (68%), cowpeas (42%), meat (39%), health expenses (30%), seeds (18%), school fees (7%), debt reimbursement (6%), clothing (4%), and hiring labor (1%). (Respondents could list more than one use of the cash transfer, so the total can exceed 100%.) Consistent with other studies, less than 1% of households used the cash transfer to buy "temptation goods," defined in this context as sweets (such as doughnuts and cookies) and tea (Evans and Popova 2014). Thus, program recipients primarily used the transfer to ensure immediate consumption needs, as well as make limited agricultural investments and avoid asset depletion. These purchasing patterns, especially purchases of bulk grain, are similar to those found in Hoddinott et al. (2014) in the context of a cash transfer program in Niger.

As we do not have a full expenditure module, we are unable to show the impact of the transfer on total expenditures or the quantities demanded. Nevertheless, we do have data on the uses of the transfer. While this constrains our analysis, these outcomes can provide important insights, as the transfer represented a significant income shock to recipient households. In addition, since

TABLE 3
BASELINE INDIVIDUAL AND HOUSEHOLD OUTCOMES (BY TREATMENT STATUS)

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Food security outcomes and coping strategies			
Number of months of household food provisioning (scale of 6)	1.93	.19	.14	.06
	(1.56)	(.15)	(.14)	(.14)
Household diet diversity index (scale of 12)	3.10	.04	−.08	.12
	(2.03)	(.19)	(.18)	(.16)
	B. Migration and remittances			
One household member migrated since the last harvest	.47	.03	.02	.01
	(.50)	(.05)	(.05)	(.05)
Number of remittances received since the past harvest	.71	.24	.08	.16
	(1.89)	(.20)	(.17)	(.19)
Received remittance via m-money transfer (Zap)	.02	.00	.01	−.00
	(.13)	(.01)	(.01)	(.01)
	C. Agricultural production and livestock			
Cultivate land	.98	−.02	−.01	−.00
	(.13)	(.01)	(.01)	(.01)
Produce millet	.97	−.01	.01	−.01
	(.17)	(.01)	(.01)	(.01)
Quantity of millet produced (kg)	267	19.97	−16.25	36.22
	(363)	(52.86)	(43.77)	(40.03)
Produce cowpeas	.87	−.03	−.07*	.05
	(.34)	(.03)	(.04)	(.04)
Quantity of cowpeas produced (kg)	9.06	2.34	.98	1.36
	(30)	(2.44)	(2.73)	(2.49)
Produce *vouandzou* or okra	.54	.00	−.02	.02
	(.50)	(.06)	(.05)	(.05)

Note. Pretreatment comparison of individual and household outcomes in each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 SEs clustered at the village level are in parentheses. $N = 1{,}105$.
* Significant at the 10% level.

households only had two income sources before the program and did not receive other public aid, it is reasonable to assume that households' marginal propensity to consume was high and that the uses of the transfer would approximate overall expenditures during this period.

Table 4 shows the different uses of the cash transfer by treatment group, using data from December 2010. Overall, the results paint a picture of more diverse uses of the cash transfer by Zap households, primarily for food items.

TABLE 4
USES OF THE CASH TRANSFER

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Uses of cash transfer for food items			
Number of food and nonfood items purchased with cash transfer	4.32	.78***	−.07	.85***
	(2.46)	(.24)	(.24)	(.25)
Transfer used to buy staple grains (millet, sorghum)	1.00	−.01	.00	−.01
	(.05)	(.01)	(.01)	(.01)
Transfer used to buy other grains (corn, rice)	.56	.18***	−.02	.20***
	(.50)	(.05)	(.05)	(.06)
Transfer used to buy cowpeas	.40	.09*	−.01	.10**
	(.49)	(.05)	(.05)	(.05)
Transfer used to buy condiments	.68	.11**	−.02	.12***
	(.47)	(.05)	(.04)	(.04)
Transfer used to buy oil	.68	.13***	−.01	.15***
	(.47)	(.05)	(.05)	(.05)
Transfer used to buy meat	.38	.16***	−.02	.18***
	(.49)	(.04)	(.04)	(.04)
	B. Uses of cash transfer for nonfood items			
Transfer used to pay school fees	.07	−.02	−.01	−.01
	(.26)	(.02)	(.02)	(.02)
Transfer used to pay health expenses	.30	−.01	−.03	.03
	(.46)	(.03)	(.04)	(.03)
Transfer used to buy clothes	.04	.01	.00	.00
	(.20)	(.02)	(.03)	(.02)

Note. Simple difference comparison of households in each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 SEs clustered at the village level are in parentheses. $N = 1{,}047$.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

Households in Zap villages purchased .78 more types of food and nonfood items as compared with the Cash group, and .85 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 transfer mechanism, program participants in the Zap group were 18–20 percentage points more likely to purchase nonstaple grains (rice and corn), 9–10 percentage points more likely to purchase cowpeas, and 11–18 percentage points more likely to purchase condiments, oil, and meat as compared with those in the Cash and Mobile groups (panel A). Most of these differences are statistically significant at the 1% level. Yet there are no statistically significant

differences in the uses of the cash transfer with respect to school fees, health expenses, and clothing (panel B).[22] These patterns are similar when restricting the analysis to the last transfer (table A2).[23]

B. Food Security and Nutritional Status

While the results in table 4 suggest that Zap households used the cash transfer differently, especially with respect to food items, without a full expenditure module, this would not necessarily indicate a net welfare improvement. In particular, Zap program recipients' spouses could have contributed fewer public or private goods to the household as a result of the cash transfer, potentially distorting the uses of the transfer or consumption. While we are unable to assess the impact of the program on household expenditures, table 5 estimates the impact of the different treatments on proxy measures of well-being, namely, household food security and nutritional status.[24]

Table 5 (panel A) shows the estimates of the effect of different transfer delivery mechanisms on household food security, using pooled data from December 2010 and May 2011. Zap households had diet diversity scores that were .28–.51 points higher than the Cash and Mobile households, with a statistically significant difference at the 10% and 1% levels, respectively.[25] Focusing on particular food groups, Zap households were 6 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 Cash and Mobile households. All of these differences are statistically significant at the 1% or 5% level. These results are also largely robust to using an ANCOVA specification

[22] A potential concern with self-reported measures is that program recipients could simply list the first (or largest) expenditures made after receiving the transfer, which could differ by treatment group. 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 cited specific categories, enumerators were instructed to go through a comprehensive list of all potential categories and ask the recipient whether they spent the cash transfer on that particular category.

[23] Measuring the impact of the different treatments on the intensive margin of food expenditures reveals that Zap households spent slightly more on other grains, cowpeas, and oil and slightly less on staple grains as compared with Mobile and Cash households. However, these results are not statistically significant, and the magnitudes are relatively small (between US$.010 and US$1.00).

[24] The primary food security measure used is the household diet diversity index, a standard index developed by Food and Nutrition Technical Assistance (FANTA). The index asks about household-level consumption of specific food groups over the past 24 hours, including cereals, tubers, legumes, milk, fish, meat, oils, condiments, eggs, fruits, vegetables, and sugar (FANTA 2006). A more varied diet is associated with a number of improved outcomes in areas such as birth weight (Rao et al. 2001), child anthropometric status (Allen et al. 1991; Onyango, Koski, and Tucker 1998; Hatloy et al. 2000), and food expenditures (Hoddinott and Yohannes 2002; Thorne-Lyman et al. 2010).

[25] While Mobile households had diet diversity that was .23 points lower than the Cash households, this seems to be primarily driven by the lower likelihood of consumption of condiments among Mobile households.

TABLE 5

IMPACT ON FOOD SECURITY AND NUTRITIONAL STATUS

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
		A. Food security		
Household diet diversity score (out of 12)	3.17	.28*	−.23*	.51***
	(1.70)	(.15)	(.13)	(.14)
Consumption of:				
Grains	.99	.00	.00	.00
	(.10)	(.01)	(.01)	(.00)
Beans	.18	.06**	−.01	.07**
	(.39)	(.03)	(.02)	(.03)
Fats	.29	.09**	−.02	.11***
	(.45)	(.03)	(.03)	(.03)
Meat	.06	.02	−.00	.03*
	(.24)	(.02)	(.02)	(.01)
Condiments	.36	−.01	−.08**	.07*
	(.48)	(.05)	(.04)	(.04)
Fruit	.02	.03**	−.01	.03***
	(.15)	(.01)	(.01)	(.01)
Number of observations		2,167		
		B. Child nutritional status		
Number of meals eaten by children under 5 in past 24 hours	3.17	.33**	.05	.28**
	(1.71)	(.15)	(.14)	(.12)
Diet diversity of children under 5	2.33	.20	−.22	.42**
	(1.80)	(.23)	(.18)	(.17)
Weight-for-height *z*-score	−1.15	.06	−.03	.09
	(.96)	(.12)	(.15)	(.13)
Number of observations		543		
		C. Durable and nondurable goods		
Number of asset categories owned (out of 11, excluding mobile phones)	3.05	.12	−.19*	.31***
	(1.28)	(.11)	(.11)	(.09)
Durable assets (plows, carts, bikes, and motos)	.18	−.01	−.07**	.05
	(.49)	(.04)	(.03)	(.03)
Nondurable assets (flashlights, petrol lamps, and radios)	1.63	.12	−.08	.20***
	(.87)	(.07)	(.07)	(.07)
Number of observations		2,210		

Note. Simple difference estimates for each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 SEs clustered at the village level are in parentheses. Panels A and C include pooled data from the December and May rounds, whereas panel B includes data from the May round only.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

and the December 2010 or May 2011 data separately (table A3 and fig. A1; figs. A1, A2 available online).[26] Overall, these effects represent a 30% increase in consumption of beans and fats, particularly important food groups given the high prevalence of protein-energy malnutrition in Niger (INS 2013). In addition, the increased food consumption categories are broadly correlated with the more diverse purchases observed in table 4.[27]

Table 5 panel B shows the results of the cash transfer delivery mechanism on child nutritional outcomes, using data from May 2011. While children in Cash villages ate 3.16 meals per day, children in Zap households ate an additional one-third of a meal as compared with those in the Mobile and Cash groups, with a statistically significant difference at the 5% level. Similarly, children in Zap households had diet diversity scores that were 12%–14% higher as compared with those in the Mobile and Cash groups, although this was only statistically significant for one pairwise comparison. Yet these improvements did not translate into changes in nutritional status, as measured by weight-for-height *z*-scores. This could be partially due to the imprecision of the estimates, as nutritional data were collected for a subset of villages. In addition, improved child nutritional status is only positively correlated with diet diversity when diet diversity is greater than three food groups, which is not the case in our context (Labadarios et al. 2011).

While we would not necessarily expect asset accumulation as a result of the cash transfer program, we test for impacts on household asset ownership to verify that other household members were not reducing their contribution to household public or private goods (table 5 panel C). Excluding mobile phones, Zap households owned .12–.31 more asset categories as compared with those in the Cash and Mobile groups, respectively, although only the latter pairwise comparison is statistically significant at conventional levels. The Zap transfer mechanism did not have a strong impact on households' durable (carts, plows, bikes, and motos) or nondurable (flashlights, petrol lamps, and radios) asset ownership, although nondurable asset ownership was higher in Zap households

[26] The diet diversity results are broadly consistent when using only the December 2010 or the May 2011 data, suggesting that these results hold in the short and longer term (table A3). While overall diet diversity is higher in December 2010, it drops in May 2011, consistent with the hungry period. Yet the impact of the m-transfer mechanism on diet diversity is stronger in May 2011, 6 months after the end of the program.

[27] While Zap households were more likely to purchase meat (table 4), this did not translate into a higher likelihood of meat consumption (table 5). This could be partially due to the different reference periods for the outcome measures. Table 4 asked households how they used the cash transfer (the last transfer was in October 2010), whereas table 5 asked about household consumption in the past 24 hours (which occurred in December 2010). While grains, oils, and beans are storable, meat is perishable unless dried. Thus, we would not necessarily expect to see an increase in meat consumption 2 months after the last cash transfer.

as compared with Mobile households. Overall, these results suggest that household members were not reducing their contribution of public or private goods to the household as a result of the cash transfer. These results are consistent when using an ANCOVA specification or using data from the December or May rounds (table A3).

IV. Potential Mechanisms

One of the core results in this article is that receiving a cash transfer via mobile money led to different uses of the transfer and increased household diet diversity, primarily for certain food groups. Our experimental design allows us to conclude that these results are due to the m-transfer mechanism and not to the mobile phone. This section presents evidence on the channels through which the observed impacts occurred.

A. Reduced Costs of Obtaining the Transfer

A key claim of those supporting the use of electronic transfers is that they will reduce the costs of implementing the program, including leakage. Yet whether these cost reductions accrue to program recipients depends on the local electronic payments infrastructure. While Concern Worldwide tried to minimize the distance that Cash and Mobile program recipients had to travel to obtain their transfers, a standard practice in such programs, Concern did not have control over the placement of registered m-money agents, which was managed by the mobile phone operator.

Figure 1 shows the recipients' travel 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 lower costs to obtain the transfer. Whereas Cash and Mobile program recipients traveled an average of approximately 4 kilometers (round-trip) from their home village to obtain the transfer, Zap program recipients traveled 2 kilometers to "cash out" at the nearest agent, with a statistically significant difference at the 1% level.[28] This is equivalent to a travel time savings of approximately 1 hour for each cash transfer, or 5 hours over the entire program. However, this analysis excludes the Cash program recipients' waiting time during the transfer, which averaged 4 hours per cash transfer, as compared with 30 minutes for Zap recipients.[29] Including wait time, the av-

[28] Hoddinott et al. (2014) find that the average travel and wait time for cash transfers in Niger was 1 hour, using a portable ATM system.

[29] While the average wait time for manual cash transfers was 4 hours, this ranged from 1 to 8 hours. The corresponding wait time for Zap recipients was 15 minutes to 1 hour (personal correspondence with Concern).

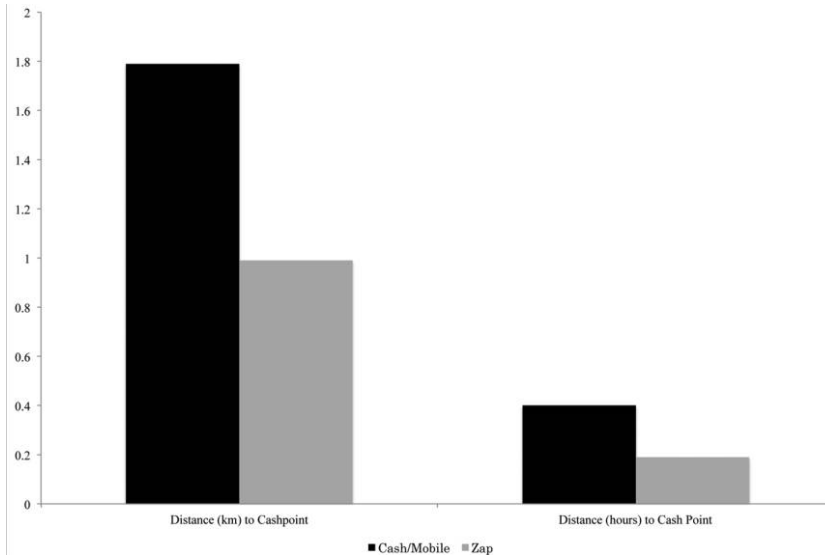

Figure 1. Mean cost (in kilometers and hours), by transfer mechanism, for program recipients' travel to the nearest cash point to obtain their cash transfer. Data were obtained from the household surveys and Concern Worldwide's list of distribution points for the manual cash villages.

erage cost savings to Zap program recipients over the program period would have been approximately 20 hours. On the basis of an average daily agricultural wage of US$3, this would translate into US$7.50 over the life of the program, equivalent to approximately 20 kilograms of grain at the time.

While the Zap transfer mechanism reduced recipients' costs of obtaining the transfer, contrary to Muralidharan et al. (2016) we do not find any effects on leakage. Overall, leakage was very low: 98% of Cash recipients reported receiving their transfer and received CFA 95,000 over 4.4 transfers (table 6). Only one of these differences was statistically significant across the three treatment arms. Part of the difference between the cash transfer balance received (US$200) as compared with the target (US$225) can be explained by the seed distribution program, whereby part of cash transfer was replaced by an equivalent value of seeds.[30] Yet even if these differences were due to actual leakage, this would represent between 4% and 10% of the total value of the transfer (US$1.50–US$7.50).

While the time savings results are small in magnitude, this occurred during the agricultural planting season, when program recipients' opportunity costs

[30] In an effort to reduce the likelihood of theft during the manual cash distribution, Concern Worldwide monitored all activities and hired security to guard the cash during transport. Those costs represented over 60% of the manual cash transfer distribution budget.

TABLE 6
LEAKAGE

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
Program recipient received cash transfer	.98	−.02	.02	−.04**
	(.16)	(.02)	(.01)	(.02)
Number of transfers received	4.44	−.12	−.03	−.09
	(1.27)	(.11)	(.13)	(.13)
Amount of money received (CFA)	95,637	−501.70	−454.96	−46.74
	(30,844)	(2,762.16)	(3,137.43)	(2,903.12)

Note. Simple difference comparison of households in each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 SEs clustered at the village level are in parentheses. $N = 1,079$.
** Significant at the 5% level.

were relatively higher. This suggests that the estimates are a lower bound, as most Cash program recipients had to travel from their fields—often located 1.5 hours from their village—before obtaining the transfer. Yet Zap recipients had greater flexibility in choosing a time to cash out, which could have freed up their time to engage in more productive agricultural activities or spend more time on childcare or food preparation. While we do not have data on the latter, we have some suggestive evidence of the former: Zap program recipients were 7–13 percentage points more likely to plant okra and *vouandzou* than their Cash and Mobile counterparts (table A4). There are few differences across treatments in planting other staple food and cash crops, and this did not translate into higher production or sales. As okra and *vouandzou* are marginal cash crops grown by women, this suggests that some of the time savings could have been used for agricultural activities.[31]

B. Differential Timing and Location of the Cash Out and Expenditures

The differential uses of the transfer and diet diversity by Zap households could also be due to changes in the timing and location of household expenditures. 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 (table 7, panel A). By contrast, Zap households were 36–39 percentage points less likely to receive their cash on the same day that it was available, cashing

[31] This increase in the likelihood of planting these cash crops did not appear to have a strong income effect, as the amount harvested and sold was extremely small. As women had to negotiate access to land with their spouses to cultivate these crops, this suggests a potential shift in intrahousehold bargaining, which is discussed below. While households in the Zap and Mobile treatments were more likely to sell cowpeas, this is compared to a mean of 0 in the Cash group.

TABLE 7
LOCATION, KNOWLEDGE, AND TIMING OF CASH TRANSFER EXPENSES

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Timing of receipt of transfer			
Obtained transfer the same day	.89	−.39***	−.03	−.36***
	(.32)	(.06)	(.03)	(.05)
	B. Timing of expenditures			
Spent money all at once	.60	−.03	−.03	.00
	(.49)	(.04)	(.04)	(.04)
Spent money at least two times	.40	.03	.03	−.00
	(.49)	(.04)	(.04)	(.04)
	C. Location of expenditures			
Spent transfer at kiosk in village	.42	.04	−.04	.08
	(.49)	(.06)	(.05)	(.06)
Spent transfer at market within village	.23	−.01	.03	−.04
	(.42)	(.09)	(.08)	(.08)
Spent transfer at market outside village	.63	.03	−.00	.03
	(.48)	(.08)	(.08)	(.08)
	D. Knowledge of cash transfer			
Knew correct amount of cash transfer	.13	.01	−.01	.02
	(.33)	(.03)	(.02)	(.03)
Knew correct duration of cash transfer	.12	.02	−.02	.04
	(.33)	(.03)	(.02)	(.03)

Note. Simple difference estimates for each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 SEs clustered at the village level are in parentheses. $N = 1{,}047$.
*** Significant at the 1% level.

out 1–4 days after receiving the notification. While the lag time between being informed of the transfer and actually receiving the transfer was only 1–2 days longer in Zap villages, these additional days provided program recipients with greater flexibility during a particularly busy time of year.

Zap program recipients also had the option of withdrawing their transfer in smaller amounts, thereby allowing them to use the mobile phone as a savings device and avoid unplanned expenditures. The cash-out data reveal 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 representative, 2011). This could, in part, be due to the fact that Zap households would have had to pay a fee for any additional withdrawals. In fact, less than 5% of households had any value remaining in their mobile phone 1 month after the last transfer, and those that did saved less than US$0.15.

The slight change in the timing of the withdrawal could have modified the timing and location of household expenditures. Yet 60% of Cash households reported spending their transfer all at one time (table 7, panel B), without a statistically significant difference in the timing of purchases among the treatments. The results are similar for the location of expenditures: Zap households did not have significantly different purchasing patterns as compared with their Mobile and Cash counterparts (panel C). Overall, these results suggest that while the m-transfer mechanism increased the lag time between learning about the cash transfer and receiving the cash, it did not change when or where households spent the money.[32]

C. *Increased Use of Mobile Phones*

With access to the mobile phone handset, Zap households could have been better informed about agricultural prices, thereby affecting their purchasing decisions and diet diversity. While this channel should, in theory, yield similar results for both the Zap and Mobile groups, in practice, Zap program recipients could have felt a greater sense of "ownership" over the mobile phone, as the transfer was specifically linked to the handsets.

Table 8 shows the impact of the different transfer mechanisms on mobile phone usage, using pooled data from December 2010 and May 2011. Unsurprisingly, mobile phone usage was higher among the Zap and Mobile households as compared with the Cash households (panel A). While Zap and Mobile program recipients were more active mobile phone users, especially for personal communications, there were no statistically significant differences in mobile phone usage for commercial activity or asking for help (panel A). Thus, while we cannot rule out that the mobile phone handset affected Zap households' outcomes in some unobservable ways, it did not lead to increased access to market information, at least in the short term.[33]

Access to the m-transfer technology also did not affect Zap program recipients' access to private transfers (table 8, panel B). While the probability and intensity of seasonal migration was slightly higher among Zap households, this did not translate into changes in remittances: there were no statistically

[32] 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 13% of Cash program participants could correctly cite the total amount or duration of the cash transfer before the program, with no statistically significant difference among the Zap, Cash, and Mobile treatments (table 7, panel D).

[33] The regressions in table 8 (panel A) were estimated by imputing a zero value for those recipients who had not used a mobile phone. We also estimated this table conditional on whether the recipient had used a mobile phone since the last harvest. The results are largely robust to this alternative specification.

TABLE 8

MOBILE PHONE OWNERSHIP AND USAGE

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Mobile phone ownership and usage			
Program recipient used mobile phone since last harvest	.46	.33***	.15***	.18***
	(.50)	(.04)	(.04)	(.04)
Made or received calls	.45	.30***	.15***	.15***
	(.50)	(.04)	(.04)	(.04)
Sent or received a "beep"	.03	.12***	.04***	.08***
	(.17)	(.02)	(.01)	(.02)
Received credit via Zap	.00	.19***	.03**	.16***
	(.07)	(.02)	(.01)	(.02)
Communicated with family/friends inside Niger	.18	.29***	.13***	.16***
	(.39)	(.04)	(.03)	(.04)
Communicated with family/friends outside Niger	.16	.09***	.02	.07***
	(.36)	(.03)	(.02)	(.02)
Communicated with commercial contacts inside Niger	.00	.01**	.01***	−.00
	(.00)	(.00)	(.00)	(.01)
Used mobile phone to communicate death/ceremony	.07	.12***	.08***	.04
	(.26)	(.03)	(.02)	(.03)
Used mobile phone to obtain price information	.01	−.00	.01	−.01
	(.11)	(.01)	(.01)	(.01)
Used mobile phone to ask for help/support	.07	.04	.03	.00
	(.26)	(.03)	(.02)	(.02)
Number of observations	2,116			
	B. Migration, remittances, and mobile transfers			
At least one household member migrates	.39	.08*	.05	.03
	(.49)	(.05)	(.05)	(.04)
Percentage of household members who migrated	.05	.02*	.01	.01
	(.08)	(.01)	(.01)	(.01)
Household received remittances as income	.21	.05	.01	.04
	(.41)	(.03)	(.03)	(.03)
Amount of remittances received for last transfer (CFA)	4,216	493.24	225.33	267.92
	(12,385)	(842.57)	(875.49)	(825.93)
Number of remittances since last harvest	.52	.19	−.00	.19
	(2.45)	(.16)	(.12)	(.14)
Received remittance via Western Union	.06	−.01	−.02	.02
	(.25)	(.01)	(.01)	(.01)
Received remittance via friend	.10	.04	.03	.01
	(.30)	(.02)	(.02)	(.02)
Received remittance via Zap	.00	.00	−.00	.00
	(.04)	(.00)	(.00)	(.00)
Number of observations	2,217			

Note. Simple difference estimates for each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 1,052, but most regressions have a sample size of 666 observations (conditional on whether the respondent or household had used a mobile phone). Heteroskedasticity-consistent SEs clustered at the village level are in parentheses.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

significant differences in the frequency or amount of remittances received or the remittance mechanism. These findings are robust when limited to one time period and also when conditioning on those households affected by a shock (not shown). These results are not surprising, as the agent network was not widespread at the time, and the m-transfer system could not be used for transfers to Nigeria, the destination for a majority of migrants.[34]

D. Inter- and Intrahousehold Dynamics

Unlike the manual cash mechanism, the Zap transfer mechanism made it more difficult for others to immediately observe the arrival of the transfer, as the program recipient was notified of the transfer arrival via a discrete beep. This was particularly relevant for Zap transfer recipients, many of whom wore their phones around their necks so that they could be notified of the m-transfer at any place or time.[35] In theory, this could have allowed Zap program recipients to have private information about the arrival of the transfer, thereby affecting their bargaining power with respect to how the cash transfer was used within or outside of the household.[36] While the Zap treatment did not have an impact on the likelihood of interhousehold sharing (table A5), it did appear to affect intrahousehold dynamics. In focus group interviews, Zap program recipients reported that they did not immediately inform their spouses about the arrival of the transfer but waited until they were in the privacy of their home. By contrast, since Cash and Mobile program recipients often obtained their transfer with other household members, they immediately provided the cash transfer to that family member, with little opportunity to discuss how the transfer would be used.

Table 9 tests for the impact of the Zap intervention on intrahousehold decision making.[37] Overall, 53% of program recipients in the Cash villages re-

[34] The regressions in table 8 (panel B) were estimated by imputing a zero value if the household did not have any migrants. We also estimated these results conditional on whether the household had a migrant. The results are largely robust to this specification.

[35] While we do not have administrative data on the actual timing of the m-transfers or the time of the day that the beeps were received, Concern Worldwide transferred the money during the day. These are times when female program recipients would typically be away from home, searching for water and firewood or working in the field.

[36] The program was implemented in an area of Niger where sociocultural norms often do not permit younger, married women of the Hausa ethnic group to travel to markets (Coles and Mack 1991). As most of the women in our sample are married and less than 45 years old, we would not expect to find strong effects of the m-transfer mechanism on women's visible control over the cash transfer, such as spending it on their own.

[37] In order to formally test for differences in intrahousehold 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. In addition,

TABLE 9
INTRAHOUSEHOLD DECISION MAKING

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Decision making regarding cash transfer			
Program recipient responsible for spending part of cash transfer	.53	−.01	−.03	.02
	(.50)	(.03)	(.04)	(.04)
Program recipient involved in deciding how to transfer	.99	.01	.01	−.00
	(.09)	(.01)	(.01)	(.01)
Number of observations	1,040			
	B. Women's involvement in agriculture			
Program recipient visited market in past week	.19	.09**	−.04	.14***
	(.39)	(.04)	(.04)	(.04)
Program recipient involved in selling grain for household	.15	.04	−.02	.06**
	(.36)	(.03)	(.03)	(.03)
Number of observations	1,063			
	C. Clothing expenditures for Muslim festivals			
Household spent money on women's or children's clothing for festivals	.43	.10*	.03	.07
	(.50)	(.05)	(.05)	(.04)
Amount spent on children's clothing for festivals (CFA)	4,569	1,760.79**	−337.10	2,097.89**
	(8,185)	(875.67)	(782.04)	(833.35)
Number of observations	1,022			

Note. Simple difference estimates for each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 include observations from male-headed households only. Heteroskedasticity-consistent SEs clustered at the village level are in parentheses.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

ported that they were responsible for spending at least part of the cash transfer, and almost all recipients (99%) stated that they were consulted on how to spend the cash transfer. There was no statistically significant difference in either of these outcomes among the three groups (panel A).[38]

a large number of zero expenditures for males does not allow us to compute the ratio of women to male expenditures.

[38] Program recipients who were primarily responsible for spending the cash transfer were female-headed households (13% of the sample) and those from the Fulani and Touareg ethnic groups, for whom the travel restriction was not a primary constraint. Nevertheless, even in these cases, less than 2% of these recipients were solely responsible for spending all of the cash transfer. We do not have sufficient variation to estimate heterogeneous results by female-headed household or ethnicity.

Table 9 also assesses the impact of the m-transfer on other proxy indicators of intrahousehold decision making, many of which are common in much of the female empowerment literature (Attanasio and Lechene 2002; Bobonis 2009; Doepke and Tertilt 2014). Zap program recipients were more likely to travel to weekly markets and to be involved in the sale of household grains than Mobile or Cash households, although only the former comparison is statistically significant at conventional levels (panel B). The Zap intervention also affected women's and children's clothing expenditures for Muslim festivals (panel C): Zap households were 7–10 percentage points more likely to spend money on women's and children's clothing and spent approximately 40% more as compared to the Cash and Mobile treatments.[39]

Taken together, the results in table 9 provide suggestive evidence that the m-transfer mechanism affected intrahousehold decision making, thereby affecting households' uses of the transfer and food security. This could have happened in one of three ways. First, male members of Zap households could have been less likely to spend the transfer on temptation goods. Second, women might have been better able to hide the transfer amount from their husbands, allowing them to purchase more diverse foodstuffs on their own. Finally, women in Zap households might have been better able to convince their husbands to spend more on higher-quality foods or to invest extra effort in finding lower prices for staple foods, thereby freeing up income.[40] As we do not have data on temptation good spending, we are unable to rule out the first hypothesis. The second hypothesis is not supported by the data on the location of expenditures (table 7). We posit that the third mechanism is potentially at work, although we only have qualitative data to support this.[41]

V. Alternative Explanations

There are several potential confounds to the above findings. A first potential confounding factor could emerge if the registration of Zap agents (who were already village residents or traders) provided new types of financial or commer-

[39] While much of the literature calculates the ratio of male to female or male to child clothing expenditures (Lundberg, Pollak, and Wales 1997), very few households in our sample spent money on male clothing, so we concentrate on women's and children's clothing expenditures.

[40] An additional test of the intrahousehold bargaining channel would be to measure the impacts of the Zap program for male- and female-headed households. If the program truly changed intrahousehold bargaining, then the effects should be apparent for male-headed households only. While we conduct this analysis, 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%), as well as the fact that the male- and female-headed households differ in observable and unobservable ways.

[41] Qualitative and quantitative evidence suggest that men in Zap households were willing to travel farther to larger markets, suggesting that the third mechanism could have taken place.

cial services to households, thereby improving Zap households' access to foodstuffs and agricultural inputs. Table 10 (panel A) shows that this is not the case. Only 3% of Cash villages had a Zap agent, and there was not a statistically significant difference in the likelihood or number of Zap agents among 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.

In figure 1 and tables 4 and 5 (our primary outcomes of interest), we examined the impact of the Zap program on multiple outcomes for three treatment interventions. This raises concerns that the observed effects cannot be attributed to the Zap intervention but are simply observed by chance among all of the different outcomes. Following Sankoh, Huque, and Dubey (1997), we use a Bonferroni correction that adjusts for the mean correlation among outcomes, focusing on the key outcomes of interest. Using an alpha of 10%, and assuming an intervariable correlation of .08 (for transfer uses) to .35 (for household diet diversity), the Bonferroni *p*-value (adjusting for correlation) would therefore be between .002 and .005.[42] The outcomes that remain significant at these adjusted levels are program recipients' cost of obtaining the cash transfer (fig. 1), the different uses of the cash transfer in table 4 (with the exception of cowpeas and condiments), and the increased consumption of fats and higher diet diversity (for the Zap group as compared with the Mobile group) in table 5. Thus, we are confident that the Zap intervention affected recipients' costs in obtaining the cash transfer, recipients' uses of the transfer, fat consumption, and household diet diversity.[43]

A final potential confounding factor is the differential effect of the transfer mechanism on food prices (Cunha et al. 2013). 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

[42] The Bonferroni correction without accounting for interoutcome correlation would yield an adjusted *p*-value of .001. However, in the case of correlated outcome variables, the mean correlation between variables can be included as a parameter in the Bonferroni adjustment (simple interactive statistical analyses; Sankoh et al. 1997). A mean correlation of 0 would yield the full Bonferroni adjustment, whereas a mean correlation of 1 would mean no adjustment. A less restrictive test than the Bonferroni adjustment would be the use of false discovery rate (FDR) techniques (Anderson 2008).

[43] Fat consumption and household diet diversity are only robust to the Bonferroni correction for the Zap-Mobile pairwise comparison.

TABLE 10
ALTERNATIVE EXPLANATIONS

	Cash Average Mean (SD)	Zap − Cash Coeff. (SE)	Mobile − Cash Coeff. (SE)	Zap − Mobile Coeff. (SE)
	(1)	(2)	(3)	(4)
	A. Access to village-level infrastructure			
Market located within the village	.25	−.02	−.12	.10
	(.44)	(.11)	(.10)	(.09)
Zap agent in village	.03	−.05	.01	−.06
	(.18)	(.03)	(.05)	(.05)
Number of Zap agents in village	.07	−.10	−.05	−.05
	(.38)	(.08)	(.11)	(.06)
Number of observations	96			
	B. Shocks			
Household was affected by drought in 2010/2011	.66	−.04	−.02	−.02
	(.47)	(.05)	(.05)	(.05)
Household was affected by illness in 2010/2011	.69	−.00	−.02	.02
	(.46)	(.03)	(.03)	(.03)
Number of observations	1,093			

Note. Simple difference estimates for each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 SEs clustered at the village level are presented in parentheses.

were less affected by the price increase or increased incentives for traders to supply those goods.[44] Table A6 shows that different cash transfer delivery mechanisms did not have differential impacts on the number of wholesalers and semiwholesalers or the number of products available on the market.

As 63% of program recipients' purchases took place in weekly markets, primarily outside of the village, we collected weekly market price data between May and September 2010 from 45 markets in the region. The randomized nature of the program implies that some markets were linked to both Cash and Zap villages, almost certainly violating the stable unit treatment value assumption.

Table A7 presents the results of a regression of the log of weekly prices in market on the cash transfer delivery mechanisms, controlling for market and time fixed effects.[45] Overall, the presence of a cash transfer in a particular

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

[45] The regression estimated in table A7 is as follows: $\ln(p_{ij,t}) = \alpha + \beta_1 \text{Zap}_{j,t} + \beta_2 \text{Cash}_{j,t} + \theta_t + \theta_j + \varepsilon_{ij,t}$, where $\ln(p_{ij,t})$ is the log price of agricultural good i in market j at week t; $\text{Zap}_{j,t}$ is an indicator variable equal to 1 if a village within a 10 kilometers radius of the market received a transfer via

market during the week did not have a statistically significant impact on food prices (panel A). The absence of an impact 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.[46]

Table A7 (panel B) measures the impact of 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 on staple grain, cowpea, or vegetable oil prices, and there is no statistically significant difference between the cash transfer mechanisms, with the exception of rice.[47] Overall, the analysis suggests that were not strong price effects due to the different transfer mechanisms.

VI. 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 and benefits 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 in 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. Yet a key question for the introduction of a new technological payment infrastructure is the cost of such programs to the implementing agency.[48] While the ini-

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zap during week t, 0 otherwise; $\text{Cash}_{j,t}$ is an indicator variable equal to 1 if a village within a 10 kilometers 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 is a set of market-level fixed effects, which capture market characteristics. Standard errors are clustered at the market level.

[46] While the results in table A7 suggest that markets were able to respond to increased demand, these results show relative changes in prices only. 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 (nondrought) marketing season, which we do not have.

[47] The one difference was for retail rice prices: the presence of a Zap transfer during a particular week increased rice prices by 2%, with a statistically significant difference between the electronic and manual cash transfer mechanisms. This is consistent with the finding that Zap households were more likely to purchase other cereals. Given the price of a bag of millet, households typically purchased small quantities (e.g., 1 kilogram) of rice. Rice is not produced in these areas of Niger, so the increase in rice prices could not have increased incentives to produce rice.

[48] The initial investment costs of the Zap program included expenses for identifying program recipients, purchasing mobile phones, and training recipients in how to use them, the latter two of which

tial costs of the Zap program were significantly higher, primarily due to the purchase of mobile phones, the per-transfer costs of the Zap transfer mechanism were approximately 20% lower than per-transfer costs of the manual cash distribution (fig. A2). Across all transfers, the per-recipient cost was US$16.43 in Cash and Mobile villages, as compared with a per-recipient cost in Zap villages of US$24.14, or US$7.70 more per recipient.[49] Excluding the cost of the mobile phones, the cost of the Zap intervention fell to US$6.78 per recipient (not shown).[50] This suggests that mobile phones could be a simple and low-cost way to deliver cash transfers once the necessary infrastructure is in place.

Yet beyond the cost reductions, 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 nondurable assets. These observed differences are primarily due to the m-transfer intervention and not to the mobile phone, suggesting that a program that jointly distributes mobile phones and cash transfers would not yield the same impacts.

While these results are promising, they suggest that electronic transfers may not lead to improved financial inclusion for all households in all contexts, as proponents might suggest. Unlike the mobile money "revolution" in Kenya, mobile money registration and usage has not grown as quickly in other parts of sub-Saharan Africa, including Niger. This suggests that substantial investment to register clients and agents would be required to establish mobile payment systems. In addition, while program recipient households in our study used mobile money to receive their transfer, they did not use it to receive remittances or to save, two important aspects of financial inclusion. This is potentially related to the limited m-money agent network in the country, a common issue in other West African countries.

Like in 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

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were for the Zap intervention only. Variable costs for the manual cash distributions included transport and security, as well as costs associated with counting the cash into individual envelopes. Equivalent variable costs for the m-transfer mechanism included the fees associated with making the transfers and staff time in managing the transfer process. The key variable costs for the Zap intervention included the transfer cost to the program recipients and program recipients' withdrawal fees.

[49] The annual per-recipient costs of cash transfer programs in sub-Saharan Africa range from US$7 (Malawi) to US$35 (Ethiopia; Arnold et al. 2011).

[50] The comparison focuses on the cost to Concern Worldwide for implementing the program, rather than to the private sector (such as the cost of maintaining the agent network, which was managed solely by the mobile phone operator). While this might omit some important costs, this is fairly standard; e.g., most electronic transfer programs do not compare the costs for maintaining a banking sector or SmartCards infrastructure after the initial investment.

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 (Attanasio, Battistin, and Mesnard 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 (Demirguc-Kunt and Klapper 2012; UNESCO 2012).[51]

Despite these caveats, the widespread growth of mobile phone coverage and m-transfer services in developing countries suggests that these constraints could be overcome. In addition, the benefits of the program in contexts 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 to register as agents.

References

Aker, Jenny C., and Isaac M. Mbiti. 2010. "Mobile Phones and Economic Development in Africa." *Journal of Economic Perspectives* 24, no. 3:207–32.

Allen, L., A. Black, J. Backstrand, G. Pelto, R. Ely, E. Molina, and A. Chavez. 1991. "An Analytical Approach for Exploring the Importance of Dietary Quality versus Quantity in the Growth of Mexican Children." *Food and Nutrition Bulletin* 13, no. 2:95–104.

Anderson, Michael. 2008. "Multiple Inference and Gender Differences in the Effects of Early Intervention: A Reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects." *Journal of the American Statistical Association* 103, no. 484: 1481–95.

Arnold, C., T. Conway, and M. Greenslade. 2011. "Cash Transfers: Evidence Paper." Department for International Development, London.

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

Ashraf, Nava. 2009. "Spousal Control and Intra-household Decision Making: An Experimental Study in the Philippines." *American Economic Review* 99, no. 4:1245–77.

Ashraf, Nava, Erica Field, and Jean Lee. 2014. "Household Bargaining and Excess Fertility: An Experimental Study in Zambia." *American Economic Review* 104, no. 7:2210–37.

Attanasio, O., E. Battistin, and A. Mesnard. 2012. "Food and Cash Transfers: Evidence from Colombia." *Economic Journal* 122:92–124.

Attanasio, O., and V. Lechene. 2002. "Tests of Income Pooling in Household Decisions." *Review of Economic Dynamics* 5, no. 4:720–48.

Banerjee, Abhijit, Esther Duflo, Rachel Glennerster, and Cynthia Kinnan. 2013. "The Miracle of Microfinance? Evidence from a Randomized Evaluation." NBER Working Paper no. 18950, National Bureau of Economic Research, Cambridge, MA.

Blumenstock, Joshua, Michael Callen, and Tarek Ghani. 2015. "Violence and Precautionary Savings: Experimental Evidence from Mobile Phone-Based Salaries in Afghanistan." Working paper, University of Washington.

Blumenstock, Joshua, Nathan Eagle, and Marcel Fafchamps. 2016. "Motives for Mobile-Based Giving: Evidence in the Aftermath of Natural Disasters." Unpublished manuscript, University of Washington.

Bobonis, Gustavo J. 2009. "Is the Allocation of Resources within the Household Efficient? New Evidence from a Randomized Experiment." *Journal of Political Economy* 117, no. 3:453–503.

Caldes, N., D. Coady, and J. Maluccio. 2004. "The Cost of Poverty Alleviation Transfer Programmes: A Comparative Analysis of Three Programmes in Latin America." FCND Discussion Paper no. 174, International Food Policy Research Institute, Washington, DC.

Coles, Catherine, and Beverly Mack, eds. 1991. *Hausa Women in the 20th Century*. Madison: University of Wisconsin Press.

Cunha, Jesse M., Giacomo De Giorgi, and Seema Jayachandran. 2013. "The Price Effects of Cash versus in-Kind Transfers." Unpublished manuscript, Naval Postgraduate School.

Demirguc-Kunt, Asli, and Leora Klapper. 2012. "Measuring Financial Inclusion: The Global Findex Database." Policy Research Working Paper no. 6025, World Bank, Washington, DC.

Doepke, Matthias, and Michele Tertilt. 2014. "Does Female Empowerment Promote Economic Development?" NBER Working Paper no. 19888, National Bureau of Economic Research, Cambridge, MA.

Doss, Cheryl. 2006. "The Effects of Intra-household Property Ownership on Expenditure Patterns in Ghana." *Journal of African Economies* 15, no. 1:149–80.

Duflo, Esther, and Christopher Udry. 2004. "Intra-household Resource Allocation in Cote d'Ivoire: Social Norms, Separate Accounts and Consumption Choices." Working paper no. 10498, National Bureau of Economic Research, Cambridge, MA.

Dupas, Pascaline, and Jonathon Robinson. 2013. "Why Don't the Poor Save More? Evidence from Health Savings Experiments." *American Economic Review* 103, no. 4: 1138–71.

Evans, David K., and Anna Popova. 2014. "Cash Transfers and Temptation Goods: A Review of Global Evidence." Policy Research Working Paper no. 6886, World Bank, Washington, DC.

Evans, David S., and Alexis Pirchio. 2015. "An Empirical Examination of Why Mobile Money Schemes Ignite in Some Developing Countries But Flounder in Most." Working paper, Institute for Law and Economics, University of Chicago.

FANTA (Food and Nutrition Technical Assistance). 2006. *Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide*. Washington, DC: Academy for Educational Development.

FEWS (Famine Early Warning Systems Network). 2010. *Niger Food Security Outlook, 2010*. Washington, DC: FEWS.

Fiszbein, Ariel, and Norbert Schady. 2009. *Conditional Cash Transfers: Reducing Present and Future Poverty*. Policy research report, World Bank, Washington, DC.

Garcia, Marito, and Charity M. T. Moore. 2012. *The Cash Dividend: The Rise of Cash Transfer Programs in Sub-Saharan Africa*. Washington, DC: World Bank.

Gentilini, Ugo, Maddalena Honorati, and Rsulan Yemtsov. 2014. *The State of Social Safety Nets, 2014*. Washington, DC: World Bank.

Government of Niger. 2007. "Plan National de Contingence: Volet Sécurité Alimentaire et Nutritionnelle." Niamey, Niger.

Handa, Sudhanshu, and Benjamin Davis. 2006. "The Experience of Conditional Cash Transfers in Latin America and the Caribbean." *Development Policy Review* 24, no. 5:513–36.

Hatløy, A., J. Hallund, M. M. Diarra, and A. Oshaug. 2000. "Food Variety, Socioeconomic Status and Nutritional Status in Urban and Rural Areas in Koutiala (Mali)." *Public Health and Nutrition* 3, no. 1:57–65.

Hoddinott, John, Susanna Sandstrom, and Joanna Upton. 2014. "The Impact of Cash and Food Transfers: Evidence from a Randomized Intervention in Niger." IFPRI Discussion Paper no. 01341, International Food Policy Research Institute, Washington, DC.

Hoddinott, John, and Yisehac Yohannes. 2002. "Dietary Diversity as a Food Security Indicator." FCND Discussion Paper no. 136, International Food Policy Research Institute, Washington, DC.

INS (Institut National de la Statistique). 2013. "Enquête Démographique et de Santé et à Indicateurs Multiples du Niger, 2012." INS and ICF International, Calverton, MD.

Jack, William, and Tavneet Suri. 2014. "Risk-Sharing and Transaction Costs: Evidence from Kenya's Mobile Money Revolution." *American Economic Review* 104, no. 1:183–223.

Jack, William, Tavneet Suri, and Robert Townsend. 2010. "Monetary Theory and Electronic Money: Reflections on the Kenyan Experience." *Economic Quarterly* 96, no. 1:83–122.

Jakiela, Pamela, and Owen Ozier. 2016. "Does Africa Need a Rotten Kin Theorem? Experimental Evidence from Village Economies." *Review of Economic Studies* 83, no. 1:231–68.

Labadarios, Demetre, Zandile June-Rose Mchiza, Nelia Patricia Steyn, Gerda Gericke, Eleni Maria Winifred Maunder, Yul Derek Davids, and Whadiah Parker. 2011. "Food Security in South Africa: A Review of National Surveys." *Bulletin of the World Health Organization* 89:891–89.

Lonie, Susie, Meritxell Martinez, Christopher Tullis, and Rita Oulai. 2015. "The Mobile Banking Customer That Isn't: Drivers of Digital Financial Services Inactiv-

ity in Cote d'Ivoire." International Finance Corporation, Mastercard Foundation, Toronto.

Lundberg, Shelly J., Robert A. Pollak, and Terence J. Wales. 1997. "Do Husbands and Wives Pool Their Resources? Evidence from the UK Child Benefit." *Journal of Human Resources* 32, no. 3:463–80.

MacAuslan, Ian. 2010. "Evaluation of Concern's Post Election Violence Recovery (PEVR) Programme." Oxford Policy Management.

Mas, Ignacio, and Colin Mayer. 2012. "Savings as Forward Payments: Innovations on Mobile Money Platforms." Unpublished manuscript, Oxford University.

Mbiti, Isaac M., and David Weil. 2011. "Mobile Banking: The Impact of M-Pesa in Kenya." NBER Working Paper no. w17129, National Bureau of Economic Research, Cambridge, MA.

McKenzie, David. 2012. "Beyond Baseline and Follow-Up: The Case for More T in Experiments." *Journal of Development Economics* 99, no. 2:210–21.

Morawczynski, Olga, and Mark Pickens. 2009. "Poor People Using Mobile Financial Services: Observations on Customer Usage and Impact from M-PESA." Consultative Group to Assist the Poor, Washington, DC.

Muralidharan, Karthik, Paul Niehaus, and Sandip Sukhtankar. 2016. "Payment Infrastructure and the Performance of Public Programs: Evidence from Biometric Smartcards in India." Technical paper, Bureau for Research and Economic Analysis of Development.

Niang, Ousmane, Véronique Mistycki, and Soukeynatou Fall. 2012. "The Impact of Safety Nets on the Resilience of Vulnerable Households in Niger." *Humanitarian Exchange Magazine* 55.

Nicholson, S. E., B. Some, and B. Kone. 2000. "An Analysis of Recent Rainfall Conditions in West Africa, including the Rainy Seasons of the 1997 El Nino and the 1998 La Nina Years." *Journal of Climate* 13.

Onyango, A., K. Koski, and K. Tucker. 1998. "Food Diversity versus Breastfeeding Choice in Determining Anthropometric Status in Rural Kenyan Toddlers." *International Journal of Epidemiology* 27, no. 3:484–89.

Penicaud, Claire. 2013. "State of the Industry: Results from the 2012 Global Mobile Money Adoption Survey." GSMA, London.

Rao, S., C. S. Yajnik, A. Kanade, et al. 2001. "Intake of Micronutrient-Rich Foods in Rural Indian Mothers Is Associated with the Size of Their Babies at Birth: Pune Maternal Nutrition Study." *Journal of Nutrition* 131, no. 4:1217–24.

Sankoh, A. J., M. F. Huque, and S. D. Dubey. 1997. "Some Comments on Frequently Used Multiple Endpoint Adjustments Methods in Clinical Trials." *Statistics in Medicine* 16:2529–42.

Thorne-Lyman, Andrew, Natalie Valpiani, Kai Sun, Richard D. Semba, Christine L. Klotz, Klaus Kraemer, Nasima Akhter, Saskia de Pee, Regina Moench-Pfanner, Mayang Sari, and Martin W. Bloem. 2010. "Household Dietary Diversity and Food Expenditures Are Closely Linked in Rural Bangladesh, Increasing the Risk of Malnutrition Due to the Financial Crisis." *Journal of Nutrition* 140: S182–S188.

UNDP (United Nations Development Programme). 2011. "Sustainability and Equity: A Better Future for All." Human Development Report 2011, UNDP, New York.

UNESCO. 2012. Education for All Global Monitoring Report. http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/efareport/statistics/.

Erratum

We regret the following errors in the October 2016 (vol. 65, no. 1) article by Jenny C. Aker, Rachid Boumnijel, Amanda McClelland, and Niall Tierney, "Payment Mechanisms and Antipoverty Programs: Evidence from a Mobile Money Cash Transfer Experiment in Niger."

Data in tables 2, 5, 6, 8, 9, and 10 are revised from those in the published article and reproduced in their entirety here, with one correction each to tables 6, 8, and 9; two corrections to tables 2 and 5; and multiple corrections of inverted signs in table 10.

On page 20, second paragraph, line 11, the text now reads that "nutritional data were collected for a subset of villages," not households. Also on page 20, second paragraph, after the second sentence, a footnote was omitted after "5 percent level," stating "The statistical significance for the Zap-Mobile comparison diminishes once commune fixed effects are excluded." On page 28, line 2, the parenthetical percentage is now 99%, not 98%. On page 30, third paragraph, line 2, a citation to Cunha et al. (2013) was added at the end of the first sentence. Reference details for the added citation are as follows:

Cunha, Jesse M., Giacomo De Giorgi, and Seema Jayachandran. 2013. "The Price Effects of Cash versus in-Kind Transfers." Unpublished manuscript, Naval Postgraduate School.

TABLE 2

BASELINE INDIVIDUAL AND HOUSEHOLD COVARIATES (BY TREATMENT STATUS)

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Sociodemographic characteristic			
Age of respondent	33.22	1.90	−.90	2.79**
	(11.05)	(1.21)	(1.24)	(1.24)
Polygamous household	.28	.04	.02	.01
	(.45)	(.04)	(.04)	(.04)
Respondent is member of Hausa ethnic group	.81	−.05	.08	−.13
	(.39)	(.08)	(.06)	(.08)
Number of household members	9.30	−.40	−.21	−.18
	(4.95)	(.63)	(.52)	(.50)
Number of household members under 15 years	5.65	−.35	−.11	−.24
	(3.42)	(.38)	(.34)	(.34)
Percentage of household members with some education	.58	−.01	.04	−.04
	(.32)	(.03)	(.03)	(.03)
	B. Household income sources and assets			
Agriculture is an income source	.98	−.01	−.01	−.00
	(.15)	(.01)	(.01)	(.01)
Livestock is an income source	.61	.06	−.03	.09*
	(.49)	(.06)	(.06)	(.05)
Remittances are an income source	.34	−.01	−.05	.04
	(.47)	(.04)	(.04)	(.04)
Number of asset categories owned (out of 12)	3.62	.07	−.15	.22
	(1.60)	(.18)	(.16)	(.14)
	C. Mobile phone ownership and usage			
Household owns mobile phone	.29	.04	−.03	.06
	(.45)	(.05)	(.04)	(.04)
Respondent has used mobile phone since last harvest	.61	.06	.00	.05
	(.49)	(.05)	(.05)	(.04)
Respondent made or received call since last harvest	.61	.06	−.00	.05
	.49	(.05)	(.05)	(.04)
Respondent sent or received m-money transfer since last harvest	.00	.00	.00	−.00
	(.00)	(.00)	(.00)	(.00)
	D. Shock			
Household experienced drought in past year	.98	−.00	.01	−.01
	(.15)	(.01)	(.01)	(.01)
Household experienced crickets in past year	.81	−.02	−.04	.01
	(.39)	(.04)	(.05)	(.05)
Number of household observations	1,106			

TABLE 2 (*Continued*)

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	E. Village-level covariate			
Market located within the village	.35	−.04	.01	−.04
	(.49)	(.13)	(.13)	(.12)
School located within village	.97	.01	−.04	.05
	(.18)	(.04)	(.05)	(.05)
Presence of a seed distribution program	.26	.04	−.04	.08
	(.44)	(.08)	(.08)	(.09)
Number of village observations	93			

Note. Comparison of individual and household covariates in each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 2 and 3 show the difference in conditional means between the different treatments and the Cash households. Column 4 shows the conditional difference in means 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—the level of stratification before randomization. Heteroskedasticity-consistent SEs clustered at the village level (for panels A–C) are in parentheses.

* Significant at the 10% level.

** Significant at the 5% level.

TABLE 5

IMPACT ON FOOD SECURITY AND NUTRITIONAL STATUS

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Food security			
Household diet diversity score (out of 12)	3.17	.28*	−.23*	.51***
	(1.70)	(.15)	(.13)	(.14)
Consumption of:				
Grains	.99	.00	.00	.00
	(.10)	(.01)	(.01)	(.00)
Beans	.18	.06**	−.01	.07**
	(.39)	(.03)	(.02)	(.03)
Fats	.29	.09**	−.02	.11***
	(.45)	(.03)	(.03)	(.03)
Meat	.06	.02	−.00	.03*
	(.24)	(.02)	(.02)	(.01)
Condiments	.36	−.01	−.08**	.07*
	(.48)	(.05)	(.04)	(.04)
Fruit	.02	.03**	−.01	.03***
	(.15)	(.01)	(.01)	(.01)
Number of observations	2,167			
	B. Child nutritional status			
Number of meals eaten by children under 5 in past 24 hours	3.17	.33**	.05	.28**
	(1.71)	(.15)	(.14)	(.12)
Diet diversity of children under 5	2.33	.20	−.22	.42**
	(1.80)	(.23)	(.18)	(.17)
Weight-for-height *z*-score	−1.15	.06	−.03	.09
	(.96)	(.12)	(.15)	(.13)
Number of observations	543			
	C. Durable and nondurable goods			
Number of asset categories owned (out of 11, excluding mobile phones)	3.05	.12	−.19*	.31***
	(1.28)	(.11)	(.11)	(.09)
Durable assets (plows, carts, bikes, and motos)	.18	−.01	−.07**	.05
	(.49)	(.04)	(.03)	(.03)
Nondurable assets (flashlights, petrol lamps, and radios)	1.63	.12	−.08	.20***
	(.87)	(.07)	(.07)	(.07)
Number of observations	2,210			

Note. Simple difference estimates for each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 SEs clustered at the village level are in parentheses. Panels A and C include pooled data from the December and May rounds, whereas panel B includes data from the May round only.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

TABLE 6
LEAKAGE

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
Program recipient received cash transfer	.98	−.02	.02	−.04**
	(.16)	(.02)	(.01)	(.02)
Number of transfers received	4.44	−.12	−.03	−.09
	(1.27)	(.11)	(.13)	(.13)
Amount of money received (CFA)	95,637	−501.70	−454.96	−46.74
	(30,844)	(2,762.16)	(3,137.43)	(2,903.12)

Note. Simple difference comparison of households in each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 SEs clustered at the village level are in parentheses. $N = 1,079$.
** Significant at the 5% level.

TABLE 8

MOBILE PHONE OWNERSHIP AND USAGE

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Mobile phone ownership and usage			
Program recipient used mobile phone since last harvest	.46	.33***	.15***	.18***
	(.50)	(.04)	(.04)	(.04)
Made or received calls	.45	.30***	.15***	.15***
	(.50)	(.04)	(.04)	(.04)
Sent or received a "beep"	.03	.12***	.04***	.08***
	(.17)	(.02)	(.01)	(.02)
Received credit via Zap	.00	.19***	.03**	.16***
	(.07)	(.02)	(.01)	(.02)
Communicated with family/friends inside Niger	.18	.29***	.13***	.16***
	(.39)	(.04)	(.03)	(.04)
Communicated with family/friends outside Niger	.16	.09***	.02	.07***
	(.36)	(.03)	(.02)	(.02)
Communicated with commercial contacts inside Niger	.00	.01**	.01***	−.00
	(.00)	(.00)	(.00)	(.01)
Used mobile phone to communicate death/ceremony	.07	.12***	.08***	.04
	(.26)	(.03)	(.02)	(.03)
Used mobile phone to obtain price information	.01	−.00	.01	−.01
	(.11)	(.01)	(.01)	(.01)
Used mobile phone to ask for help/support	.07	.04	.03	.00
	(.26)	(.03)	(.02)	(.02)
Number of observations	2,116			
	B. Migration, remittances, and mobile transfers			
At least one household member migrates	.39	.08*	.05	.03
	(.49)	(.05)	(.05)	(.04)
Percentage of household members who migrated	.05	.02*	.01	.01
	(.08)	(.01)	(.01)	(.01)
Household received remittances as income	.21	.05	.01	.04
	(.41)	(.03)	(.03)	(.03)
Amount of remittances received for last transfer (CFA)	4,216	493.24	225.33	267.92
	(12,385)	(842.57)	(875.49)	(825.93)
Number of remittances since last harvest	.52	.19	−.00	.19
	(2.45)	(.16)	(.12)	(.14)
Received remittance via Western Union	.06	−.01	−.02	.02
	(.25)	(.01)	(.01)	(.01)
Received remittance via friend	.10	.04	.03	.01

TABLE 8 (*Continued*)

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	(.30)	(.02)	(.02)	(.02)
Received remittance via Zap	.00	.00	−.00	.00
	(.04)	(.00)	(.00)	(.00)
Number of observations		2,217		

Note. Simple difference estimates for each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 1,052, but most regressions have a sample size of 666 observations (conditional on whether the respondent or household had used a mobile phone). Heteroskedasticity-consistent SEs clustered at the village level are in parentheses.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

TABLE 9

INTRAHOUSEHOLD DECISION MAKING

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Decision making regarding cash transfer			
Program recipient responsible for spending part of cash transfer	.53	−.01	−.03	.02
	(.50)	(.03)	(.04)	(.04)
Program recipient involved in deciding how to transfer	.99	.01	.01	−.00
	(.09)	(.01)	(.01)	(.01)
Number of observations		1,040		
	B. Women's involvement in agriculture			
Program recipient visited market in past week	.19	.09**	−.04	.14***
	(.39)	(.04)	(.04)	(.04)
Program recipient involved in selling grain for household	.15	.04	−.02	.06**
	(.36)	(.03)	(.03)	(.03)
Number of observations		1,063		
	C. Clothing expenditures for Muslim festivals			
Household spent money on women's or children's clothing for festivals	.43	.10*	.03	.07
	(.50)	(.05)	(.05)	(.04)
Amount spent on children's clothing for festivals (CFA)	4,569	1,760.79**	−337.10	2,097.89**
	(8,185)	(875.67)	(782.04)	(833.35)
Number of observations		1,022		

Note. Simple difference estimates for each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 include observations from male-headed households only. Heteroskedasticity-consistent SEs clustered at the village level are in parentheses.

* Significant at the 10% level.

** Significant at the 5% level.

*** Significant at the 1% level.

TABLE 10

ALTERNATIVE EXPLANATIONS

	Cash Average Mean (SD) (1)	Zap − Cash Coeff. (SE) (2)	Mobile − Cash Coeff. (SE) (3)	Zap − Mobile Coeff. (SE) (4)
	A. Access to village-level infrastructure			
Market located within the village	.25	−.02	−.12	.10
	(.44)	(.11)	(.10)	(.09)
Zap agent in village	.03	−.05	.01	−.06
	(.18)	(.03)	(.05)	(.05)
Number of Zap agents in village	.07	−.10	−.05	−.05
	(.38)	(.08)	(.11)	(.06)
Number of observations	96			
	B. Shocks			
Household was affected by drought in 2010/2011	.66	−.04	−.02	−.02
	(.47)	(.05)	(.05)	(.05)
Household was affected by illness in 2010/2011	.69	−.00	−.02	.02
	(.46)	(.03)	(.03)	(.03)
Number of observations	1,093			

Note. Simple difference estimates for each of the different treatment areas. Column 1 shows the mean and SD of the basic treatment (Cash) households, whereas cols. 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 SEs clustered at the village level are presented in parentheses.