# Mobiles and mobility:
# The Effect of Mobile Phones on Migration in Niger*

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**Abstract:** Labor markets in developing countries are characterized by large spatial differences in earnings. While such spatial wage gaps could be partly due to differences in average returns to labor, they can also be attributed to credit and insurance market failures, as well as asymmetric information with respect to potential employment and wages. Mobile phone technology could potentially alleviate some of these market failures, especially in countries with little access to other public goods. We report the results from two randomized evaluations in Niger which exogenously provided mobile phones to rural populations. While the context of the evaluations differed, we find that access to information technology substantially influenced seasonal migration in Niger, increasing the likelihood of migration by at least one household member by 6-9 percentage points and the number of households' members engaging in seasonal migration. Evidence suggests that there are some heterogeneous impacts of the program, with a higher probability of wealthier households engaging in migration. These effects do not appear to be driven by differences in households' observable characteristics or differential effects of drought during the survey period. Rather we posit that they are largely explained by the effectiveness of mobile phones as a means to search for labor market information and reduce insurance market failures. These results suggest that simple and cheap information technology can be harnessed to affect labor mobility among rural populations.

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## I. Introduction

A high degree of spatial wage dispersion across locations within the same country is a common occurrence in both developed and developing countries. Explaining this spatial wage gradient has occupied some of the founders of development economics (e.g. Lewis 1954, Harris and Todaro 1970) and it continues to generate important unanswered questions. If the gradient reflects spatial differences in the real average return to labor, it is a puzzle why more people do not move. Yet the gradient could also be due to other market failures, such as credit market failures, missing insurance markets and information asymmetries. Economists have long recognized the importance of information for individuals' migration decisions. Yet understanding the role of information is extremely difficult to test, since it very difficult to measure the information set a worker has and to create exogenous changes in those information sets.

In this paper we test the impact of an exogenous change in access to information technology – namely, mobile phones -- on labor market outcomes. To identify the effect of this technology on labor mobility, we use data from two evaluations that randomly assigned rural households with access to mobile phone technology. While the motivation and rationale for each project was quite different, we find remarkably similar results with respect to migration outcomes: Access to mobile phone technology substantially changed household migration patterns, increasing the likelihood of having at least one household member migrate by 6-9 percentage points and increasing the number and percentage of household members who engage in seasonal out-migration. There appears to be some heterogeneous effects as well, with relatively stronger effects for wealthier households.

This paper goes beyond simple estimates of the average intention to treat effect by conducting two well-identified tests. We first test some of the theoretical mechanisms giving rise to spatial wage differences, by using treatment-effect heterogeneity by pre-treatment household traits. Second, we test some of the theoretical effects of migration on remaining household members. And finally, we attempt to identify some of the causal mechanisms beyond these migration effects by assessing mobile phone usage for communicating with migrants.

The paper contributes to the literature in three ways. First, it tests competing theories of labor mobility and spatial wage differences in a developing country through an experiment designed for high internal validity. Second, it tests some of the effects *of partial*-household labor mobility on household-level development outcomes. Third, it adds to the growing literature on the economic development effects of information and communications technology (ICT). While our results are measured only for rural households who participated in both programs, seasonal outmigration is an important and widespread phenomenon in numerous countries in the Sahelian region of sub-Saharan Africa and Asia, and one on which there is little empirical evidence.

The rest of this paper proceeds as follows. Section 2 provides an overview of migration in Niger and the programs. Section 3 discusses the theoretical framework and related literature. Section 4 presents the data and estimation strategy. Section 5 discusses the main empirical results, and Section 6 concludes.

## II. Background and Experimental Design

### A. Background on Migration in Niger

Niger is one of the poorest countries in the world and the lowest-ranked country on the UN's Human Development Index (HDI). Data on migration in Niger are extremely limited; there is no ministry that collects data on Nigeriens living abroad, and in previous population censes, no questions on migration were asked. Despite these data constraints, the Demographic and Health Surveys suggest that internal and international migration play an important role in the income-generating strategies of Nigerien households. Over 45 percent of households in our sample had at least one seasonal migrant. Of those households, 56 percent had at least one international migrant, with migrants primarily concentrated within West Africa (Burkina Faso, Ivory Coast, Nigeria, Guinea, Ghana and Benin), followed by North Africa (Algeria and Libya). These migrants are overwhelming male and between the ages of 18-45 years (DHS 2006).

Potential migrants have traditionally relied upon word-of-mouth or previous migrants' experiences to obtain labor market information. Such search mechanisms can lead to costly delays and imprecise information about potential employment and wage opportunities. With the introduction of mobile phone coverage into Niger in 2001, potential migrants were able to drastically reduce their search costs, allowing them to search over a larger number of destinations more quickly.

### B. Experimental Design

*Project ABC*

The mobile phone-based programs used in this paper were developed for different objectives. Project ABC is an adult education program implemented by

Catholic Relief Services between 2009 and 2011 in the Dosso and Zinder regions of Niger. The program was designed to test the effectiveness of mobile phone technology as an educational tool for adults. While both regions are located in similar agro-climatic zones, they are over 500 km apart and exhibit distinct ethnic and environmental differences. Dosso is approximately 240 km from the capital city (Niamey), is primarily populated by the Zarma and Hausa ethnic groups and depends upon rainfed agriculture and small ruminants. Zinder, in the far east of the country, is located 750 km from the capital, is primarily populated by the Hausa and Kanuri ethnic groups and depends upon rainfed agriculture and both small and large ruminants. Due to these differences, random assignment to treatment status was conducted separately by region.

All villages participated in an adult education program, teaching basic literacy and numeracy skills in the native language of the village (either Zarma or Hausa). The first phase of the program began in February 2009. The adult education intervention covered eight months of literacy and numeracy instruction over a two-year period. Courses start in February of each year and continue until June, with a seven-month break between June and February due to the agricultural planting and harvesting season. Thus, the 2009 cohort started classes in February 2009 and finished in June 2010.

A mobile phone module (ABC) was developed to incorporate into the traditional literacy and numeracy curriculum. Participants in ABC villages therefore followed the same curriculum as those in non-ABC villages, but with two modifications: 1) participants learned how to use a simple mobile phone, including turning on and off the phone, recognizing numbers and letters on the handset, making and receiving calls and writing and reading SMS; and 2) the project

provided mobile phones to groups of literacy participants (one mobile phone per group of five people).[1] The mobile phone module began three months after the start of the literacy courses each year, and neither students, teachers nor the organizational staff were informed which villages were selected for the ABC project until two weeks prior to the start of the module. Students in ABC villages were not given additional class time, as the mobile phone module was integrated into their regular weekly class schedule.

The randomization first stratified 100 villages by region and then by administrative divisions within each region. Randomization into program and comparison groups was then carried out separately within each stratum using a random number generator. Approximately half of the villages (55) were selected to participate in the first year of classes in 2009, with half of these were selected to participate in the ABC program. The same approach was followed for the 2010 cohort.

*Project Zap*

Project Zap is a cash transfer program implemented by Concern Worldwide between 2010 and 2011 in the Tahoua region of Niger. The primary objective of the program was to provide unconditional cash transfers to approximately 10,000 households during the "hungry season", the four-month period before the harvest and typically the time of increased malnutrition. Program recipients received 20.000 CFA ($USD 40) for four months, for a total of $USD 160. Due to the humanitarian nature of the intervention and the political situation at the time of the

[1]Although the provision of mobile phones to groups of five could potentially have a wealth effect, as the phones did not belong to one specific individual, the wealth effect would be 1/5$^{th}$ the price of the mobile phone, or USD$2. Moreover the households were not allowed to sell the phone.

crisis, there was no pure control group for the cash transfer component of the project.

The basic intervention was the cash program, whereby beneficiary households unconditionally received 20,000 CFA per month (approximately $US40). The total value of the transfer was approximately 2/3 of the total annual GDP per capita. The payments were made on a monthly basis, whereby cash would be distributed in envelopes to individual recipients. Rather than distributing the cash in each village, a central village location was chosen. The program recipients had to come to that village on a given day to receive their cash transfer.

The two additional treatments were variants of the basic intervention, aiming to reduce the costs of distributing cash to remote and sparsely populated rural areas, especially those that were subject to security risks. Instead of receiving physical cash, 1/3 of program recipients received their $USD40 via a mobile phone. As less than 30 percent of households in the region owned mobile phones prior to the program, Concern also provided the beneficiaries with mobile phones, the Zap account and paid for the transfer charges. The second treatment thereby differs from the basic intervention with respect to the *mechanism* of the transfer, as well as the provision of the technology itself.

In an effort to disentangle the impact of the mobile-phone based transfer system from the mobile phone itself, the third treatment (also known as the "placebo" treatment) mirrored the basic treatment, but also provided a mobile phone. Like the first treatment, program recipients received $US40 in physical cash on a monthly basis, and had to travel to a meeting point to receive their cash. However, like the zap treatment, program beneficiaries also received a mobile phone, but could not receive their transfer via the mobile phone.

Compared to the basic treatment, the placebo treatment should allow us to disentangle the effect of having a mobile phone from the effect of the cash transfer. Comparing the zap treatment with the placebo treatment therefore allows us to determine any difference between the m-transfer system (Zap) and the traditional means of distributing cash, and comparing the zap and placebo treatments with the cash treatment allows us to understand the impact of mobile phones on migration.

Prior to the introduction of the program, "food deficit" villages – those classified by the Government of Niger as having produced less than 50 percent of their consumption needs during the 2009 harvest – were identified in the Tahoua region. Of the 116 target villages, some villages were prioritized for the zap treatment based upon their population and location in insecure areas, reducing the sample size to 96. The remaining eligible villages were therefore randomly assigned between the basic treatment (cash), placebo treatment and zap treatment, without stratifying by commune. In all, 32 villages were assigned to the cash treatment, 32 to the placebo treatment and 32 to the zap treatment.

## III. Theoretical Framework

### A. Wage differences and migration

Large rural-urban wage gaps are a common feature of developing countries. The roots of these wage gaps have held longtime importance for academics and policymakers. Such spatial differences in observed wages could reflect differences in the average real returns to labor. There is evidence that the returns to labor are indeed higher in urban than rural areas for those who self-select into rural-urban migration, both in rich (e.g. Glaeser and Maré 2001) and poor countries (Beegle, de

Weerdt, and Dercon 2011). But it is unclear if these returns generalize to the rest of the population.

If in fact there are not large gains to migration, the puzzle becomes why so many people do move; much of the developing world is on a long-term trajectory toward urbanization. Households might mitigate risk by migrating between different labor markets facing uncorrelated shocks, even if the average return to labor in the two markets is the same (Rosenzweig and Stark, 1989). Rural workers might have poor information about urban opportunities such that they overestimate urban earning potential. Spatial returns to scale in educational institutions could mean that higher levels of education occur in fewer locations, and employers located near schools can more easily recruit graduates even without offering higher wages than employers elsewhere.

If there are generalized returns to migration, there follows the question of why more people do not move to realize the gains. There are many competing explanations. First, such gaps could be related to credit constraints in the home market that prevent migrants from paying the cost of migration (e.g. Chowdhury, Mobarak, and Bryan 2009). Second, there could be insurance market failures in the destination markets, whereby the variance of returns means that expected utility is too low. Finally, there could be asymmetric information with respect to potential earnings potential (e.g. McKenzie, Gibson, and Stillman 2007) or intra-household information asymmetries, as family members in different places cannot monitor each other (e.g. Ashraf et al. 2010).

Each of these models has different observable implications for the effects of information technology on labor mobility, as well as the effects of labor mobility on household welfare. For example, if spatial wage gaps are due to differences in

average returns to labor, then the introduction of mobile phones should have no direct impacts upon migration decisions, at least not in the short term. If migration is constrained primarily by credit market failures, then the introduction of mobile phones could increase migration for poorer households. And finally, if migration is primarily constrained by asymmetric information, then mobile phone technology should reduce potential migrants' search costs and increase the likelihood of migration and job matching.

We summarize each of these models and the comparative static predictions with respect to the exogenous provision of mobile phones in Figure 1.

### B. Related Literature on Information Technology and Labor Markets

Since Todaro's seminal work of the 1950s, there has been an extensive body of literature assessing the impact of information on migration outcomes. Much of this is rooted in the job search model of Herzo, Hoffler and Schlottman (1985) and Berninghaus and Seifert-Vogt 1987. A specific subset of theoretical and empirical studies have assessed the impact of incomplete information on migration behavior, concluding that information can affect migration propensity, return migration, post-move earnings growth and job search duration after the move (Greenwood 1975, 1981, Vishwanath 1991, Gibbs 1994, Carrington et al 1996, Sato 2004, Fafchamps and Shilpi 2009, Epstein and Gang 2006).

Several recent studies have attempted to identify the effects of mobile phone coverage on development outcomes (Jensen 2007, Aker 2010), under the assumption that gradual nationwide roll-out of mobile phone service coverage is as good as plausibly exogenous. A smaller subset of the literature has attempted to identify the effect of information technology on labor market outcomes in developed (Autor 2001) and developing countries. For example, Muto (2009) finds that mobile phone

coverage is positively correlated with migration, with larger effects among ethnic groups comprising larger fractions of the population of Kampala. The magnitude and mechanism of the relationship is unclear, and household-level information on phone usage is unavailable. Klonner and Nolen (2009) analyze the impact of mobile phones on labor markets in South Africa, using geographical measures to instrument for the rollout of mobile phone coverage. They find that mobile phone coverage increases labor force participation by 15 percentage points, mainly among females. Similarly, Batzilis et al (2010) find that mobile phone coverage is associated with increased female labor force participation in Malawi, but suggest that mobile phone coverage could respond to changes in demand. Yet few of these studies are able to identify the mechanisms behind the effects using micro-level data.

## IV. Data and Estimation Strategy

### A. Household data

The timeline for both programs is presented in Figure 2. We collected detailed household surveys for both programs, interviewing a total of 1,038 households across 100 villages for the ABC program and 1,200 households across 96 villages for the Zap program. The ABC program had a baseline household survey in January 2009, with follow-up surveys in January 2010 and January 2011. The Zap program collected baseline data in April 2010, with follow-up surveys in January 2010 and April 2011. The same survey instrument was used for both programs and all rounds, allowing for comparability across treatments and rounds. Each survey collected detailed information on household demographic and labor market characteristics, including occupation, seasonal migration and migration

destinations. In addition to data on labor mobility, we also collected data on asset ownership, agricultural production and sales, access to price information, mobile phone ownership and usage and village and household-level shocks. A map of the survey areas is provided in Figure 3.

### B. Pre-Program Characteristics of ABC and Zap Programs

Tables 1a and 1b suggest that both randomizations were largely successful in creating comparable groups along observable dimensions. Differences in pre-ABC household characteristics are small and insignificant (Table 1a, Panel A). Average household size was eight. Children's educational achievements were similarly low: less than 10 percent of children aged 7-15 had ever attended primary school. Thirty percent of households in the sample owned a mobile phone prior to the start of the program, with eighty percent having access to a mobile phone within the village. Over 50 percent of respondents had used a mobile phone in the few months prior to the baseline, although almost exclusively for receiving calls. The results are similar for the zap program, although there is a statistically significant difference in the ages of respondents across the three groups.

Tables 2a and 2b provide further evidence of the comparability of the program and comparison groups for labor mobility outcomes. For the ABC program, we cannot reject the equality of means for pre-program outcomes in the full sample (Panel A). Only 10 percent of respondents had migrated within the past year, but over 43 percent of households had at least one seasonal migrant. On average, the number of migrants represented 6 percent of household members. Among households with migrants, over 45 percent had at least one migrant who moved within Niger, and 46 percent had at least one member who migrated within West Africa. The percentage of households with international migrants within West Africa

was slightly higher in ABC villages, and this difference is statistically significant at the 10 percent level.

The same patterns emerge when looking at migration outcomes across ABC and non-ABC villages by region (Panels B and C). Yet it is interesting to note the relatively different migration experiences between the Dosso and Zinder regions. Overall, the likelihood and intensity of migration appears to be stronger in Dosso as compared with Zinder; over 50 percent of households in Dosso had at least one member who migrated, as compared with 35 percent in Zinder. Dosso has relatively more migrants to destinations within West Africa.

For the Zap program, we cannot reject the equality of means for pre-program outcomes in the full sample (Table 2b). None of the respondents had migrated in the past year. This is understandable, as the program targeted women, and it is generally unacceptable for women to migrate due to cultural reasons. Approximately 50 percent of households had at least one seasonal migrant. On average, the number of migrants represented 7 percent of household members.

### C. Estimation Strategy

To estimate the impact of mobile phones on labor market outcomes, we use simple reduced form regression specifications and estimate the intention to treat. Let $Y_{ivt}$ be the labor market outcome (migration, migration location, migration of household members) of individual or household $i$ in village $v$ in year t. $ABC_v$ is the treatment status indicator of *village v*, *year* is an indicator variable for the survey round (January 2009 or January 2010), $cohort_v$ is a binary variable equal to the year the village started in the program and $\theta_R$ are geographic fixed effects at the regional or sub-regional level. $X'_{iv}$ is a vector of household or individual-level covariates, such

as sex, ethnicity and age. We first estimate the difference in differences specification for the ABC evaluation:

(1) $$Y_{ivt} = \alpha + \beta_1 ABCv + \beta_2 year_t + \beta_3 ABC_v * year_t + X'_{ivY} + cohort_v + \theta_R + \mu_{cv} + \varepsilon_{ivt}$$

where $\beta_3 ABC_v * year_t$ is the interaction between being assigned to treatment and the particular year. The coefficient of interest is $\beta_3$ which captures the average impact of the treatment, a mobile phone program. The error term consists of $\mu_v$, a common village-level error component capturing common local village characteristics, and $\varepsilon_{iv}$, which captures unobserved individual or household characteristics or idiosyncratic shocks. We cluster the error term at the village level and include village-level fixed effects in some specifications.

We use a similar specification for the zap program, including multiple interactions due to the multiple treatments:

(2) $$Y_{ivt} = \alpha + \beta_1 zap_v + \beta_2 placebo + \beta_3 year_t + \beta_4 zap_v * year_t + \beta_5 placebo_v * year_t + X'_{iv}\gamma + \mu_v + \varepsilon_{ivt}$$

where $zap_v$ is a treatment status indicator for the zap village (mobile phone plus m-transfer), placebo is a treatment status indicator for the placebo village (mobile phone only), *year* is an indicator variable for the survey round (April 2010 or January 2011), and $\theta_R$ are geographic fixed effects at the regional or sub-regional level. $X'_{iv}$ is a vector of household or individual-level covariates. We also modify equation (2) to only include the cash and non-cash treatment groups, capturing the impact of the mobile phone alone.

## V. Preliminary Results

### A. Average Effects on Labor Mobility

Tables 3a and 3b presents the results of regressions of Equations (1) and (2) for the 2009 cohort for a variety of labor mobility outcomes for both programs. The results provide evidence of the impact of mobile phones on migration patterns in Niger. Neither the ABC nor the Zap treatments affect the probability of the *respondent* migrating within a particular year (Column 1, Tables 3a and 3b). Nevertheless, the mobile phone treatments increase both the probability and intensity of migration. For the ABC program, the mobile phone treatment increases the probability of having at least one household member migrate by 7.2 percentage points (Column 2, Table 3a). As compared with the non-ABC group, this is a 17 percent increase over a one-year period. The exogenous provision of mobile phones similarly increases the probability of migration in the Zap program: as compared with the cash group, the probability of having one household member migrate increases by 9 percentage points for the Zap group and 6 percentage points for the placebo group, representing an 18-percent increase as compared with the cash group. As there is not a statistically significant difference between the zap and placebo program, this suggests that the effect is primarily due to the mobile phone ownership and not the m-transfer aspect of the program.

Mobile phones also appear to affect the *intensity* of migration within the household. The ABC program increases the number of household members who migrated by .16 (Table 3a, Column 3), the percent of household members who migrated by 2 percentage points (Table 3a, Column 4) and the percentage of active household members (adults over the age of 15) (Table 3a, Column 5). These results are robust to the inclusion of a variable for drought, regional fixed effects and individual demographic characteristics.

The results are similar in sign and magnitude for the Zap program. Mobile phone provision increased the number of household members who migrated by .19 for the Zap group (Table 3b, Column 3) and .16 household members for the placebo group (Table 3b, Column 4). Both treatments also increased the percent of household members who migrated by 3 percentage points (Table 3b, Columns 3 and 4). Overall, the results suggest that the effect is primarily due to exogenous mobile phone provision, rather than the m-transfer program.

### B. Heterogeneous Effects on Labor Mobility

Mobile phone access could have differential impacts on migration outcomes, especially based upon wealth. Wealthier households might have greater access to credit, thereby allowing them to take advantage of increased information by sending more family members to other work destinations. Conversely, mobile phone technology could help to alleviate credit-constrained poorer households by enabling them to raise the necessary funds to send the migrate to the destination.

To test for the heterogeneous impacts of both programs, we first create a variable for asset ownership at the household level. We interact this variable with each of the variables in the DD specification and focus on the triple interaction term. Tables 4a and 4b present the results of these regressions. Overall access to mobile phones does not affect the probability of migration, but the intensity: wealthier households increase the number of household members who migrate and the percentage of household members who migrate (Table 4a, Columns 3 and 4 and Table 4b, Column 4), and these results are statistically significant at the 10 percent level . This suggests that the introduction of mobile phones does not alleviate credit constraints for poorer households and increase labor mobility.

## VI. Mechanisms

The previous results suggest that access to and learning how to use mobile phones increases the probability and intensity of household migration within Niger. If migration was primarily driven by differences in average returns to labor, then the exogenous provision of mobile phones should not affect the probability or intensity of migration. Similarly, if migration was primarily constrained by credit market failures, mobile phones should increase migration for *poorer* households. As a result, we posit that there are two mechanisms through which the observed effects occur: Through the alleviation of insurance market failures, and by reducing job search costs.

While we do not have the necessary data to test for these two hypotheses, we provide suggestive evidence that both mechanisms are at work. Tables 5a and 5b show the results of a regression of a variety of mobile phone ownership, usage and transfer outcomes on treatment indicator variables for both the ABC and Zap programs, thereby providing some suggestive evidence of the effect of mobile phone technology on reducing search costs and reducing insurance failures. As each program had a significantly different approach in terms of mobile phone provision – the ABC program provided phones to groups and taught students how to use the phones, whereas the Zap program provided phones to individuals, we would expect differential effects of the program on mobile phone ownership and usage. Therefore, we discuss each one of these in turn.

*Mobile Phone Ownership, Usage and Transfers in the ABC Program*

Table 5a provides insights into the impact of the ABC program on a variety of mobile phone-related outcomes. Panel A provides background information on mobile

phone ownership and usage, whereas Panel B provides more specific information on households' uses of mobile phones to communicate with migrants and search for information. Overall, the ABC program – which primarily trained students in how to use mobile phones -- did not affect a household's mobile phone ownership, access to a mobile phone or their probability or intensity of usage. The program also did not affect individuals' "simple" mobile phone usage, such as the probability of making or receiving a call. Yet households in ABC villages used mobile phones in more "active" ways: Households in ABC villages were 11 percentage points more likely to write a SMS, 6 percentage points more likely to receive an SMS, 11 percentage points more likely to receive a beep and 2.9 percentage points more likely to send airtime credit. This suggests that the ABC program allowed them to use the communication device in a variety of ways.

Panel B shows the effect of the program on communications with different groups of individuals, including migrants; remittances; and the ways in which mobile phones were used. While the ABC program did not affect a household's *probability* of communicating with a migrant via a mobile phone – which is unsurprising, given few other alternatives – it did affect the frequency with which households communicated with that migrant. Furthermore, ABC households were 13 percentage points more likely to communicate with friends and family members within Niger using a mobile phone. The program did not affect the probability of receiving remittances or amount of remittances received. Overall, these results suggest that mobile phones affected ABC households' communications with their outside social networks, a potential channel through which jobs are found in urban or international labor markets.

*Mobile Phone Ownership, Usage and Transfers in the Zap Program*

Table 5b provides insights into the impact of the Zap program on similar outcomes. Overall, the Zap program – which primarily provided households with mobile phones and provided some households with cash transfers via those mobile phones – strongly increased respondents' ownership of and access to mobile phones for the Zap and placebo groups. The program also affected individuals' usage of the mobile phones in a variety of ways: While both treatments strongly increased a respondent's likelihood of receiving a call and "beeping", it did not affect her likelihood of making a call, sending and receiving a SMS or sending a transfer. This is in stark contrast to the ABC group. Overall, the effects are stronger in the Zap group, and there is a statistically significantly difference between the two.

Similar to the ABC program, the Zap program increased the probability of a household communicating with friends and family in Niger between 13-18 percentage points, primarily to communicate a death or other shock. Unlike the ABC program, the Zap program appeared to reduce households' likelihood of communicating with the migrant since the last harvest, but it did increase the probability that the household received remittances as income by 9 percentage points. The program did not affect the amount of remittances received. Overall, these results suggest that mobile phones affected Zap households' communications with their outside social networks, not only to obtain information on labor markets but to communicate information on shocks in the home village, which thereby facilitated remittance transfers.

## VII. Conclusion

These results suggest that access to mobile phones increases both the probability and intensity of rural-urban migration in three separate regions of

Niger, increasing migration by over 18 percent. The technology appears to benefit wealthier households, who are better able to use the technology to send more family members to domestic or foreign destinations. Mobile phone usage data suggests that these results are primarily due to two channels: Increased communication with social networks, which can increase information on labor markets in potential migration destination and reduce uncertainty; and the increased frequency of remittance transfers, which can partially overcome insurance market failures. Nevertheless, future research is required to test whether these mechanisms are truly driving the empirical results.

## References


**Ashraf, Nava, Diego Aycinena, Claudia Martínez A., and Dean Yang.** 2010. "Remittances and the Problem of Control: A Field Experiment Among Migrants from El Salvador." Unpublished. http://www.umich.edu/~deanyang/papers/aamy_remittancecontrol.pdf

**Aker, Jenny C.** 2010. "Information from Markets Near and Far: Mobile Phones and Agricultural Markets in Niger." *American Economic Journal: Applied Economics*, 2(3): 46–59.

**Aker, Jenny C. and Isaac M. Mbiti.** 2010. "Mobile phones and economic development in Africa." *Journal of Economic Perspectives*, 24(3): 207–232.

**Batzilis, Dimitrios, Taryn Dinkelman, Emily Oster, Rebecca Thornton, and Deric Zanera.** 2010. "New cellular networks in Malawi: Correlates of service rollout and network performance." National Bureau of Economic Research Working Paper 16616.

**Beegle, Kathleen, Joachim de Weerdt, and Stefan Dercon.** 2011. "Migration and Economic Mobility in Tanzania: Evidence from a Tracking Survey." *Review of Economics and Statistics*, forthcoming.

**Chowdhury, Shyamal, Ahmed Mushfiq Mobarak, and Gharad Bryan.** 2009. "Migrating Away from a Seasonal Famine: A Randomized Intervention in Bangladesh." United Nations Development Programme Human Development Reports Research Paper 2009/41.

**Glaeser, Edward L. and David C. Maré.** 2001. "Cities and Skills." *Journal of Labor Economics*, 19(2), 316–42.

**Harris, John R. and Michael P. Todaro.** 1970. "Migration, Unemployment and Development: A Two-Sector Analysis." *American Economic Review*, 60(1): 126–142.

**Jensen, Robert.** 2007. "The Digital Provide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector." *Quarterly Journal of Economics*, 122(3): 879–924.

**Klonner, Stefan and Patrick Nolen.** 2010. "Cell phones and rural labor markets: Evidence from South Africa." Unpublished. http://econstor.eu/bitstream/10419/39968/1/354_klonner.pdf

**Lall, Somik V., Harris Selod, and Zmarak Shalizi.** 2006. "Rural-urban migration in developing countries: A survey of theoretical predictions and empirical findings." World Bank Policy Research Working Paper 3915.

**Lewis, W. Arthur.** 1954. "Economic Development with Unlimited Supplies of Labor." *Manchester School of Economic and Social Studies*, 22(2): 139–191.

**McKenzie, David, John Gibson, and Steven Stillman.** 2007. "A land of milk and honey with streets paved with gold: Do emigrants have over-optimistic expectations about incomes abroad?" World Bank Policy Research Working Paper 4141.

**Muto, Megumi.** 2009. "The impacts of mobile phone coverage expansion and personal networks on migration: evidence from Uganda." Unpublished. http://purl.umn.edu/51898

**Rosenzweig, Mark and Oded Stark.** 1989. "Consumption Smoothing, Migration and Marriage: Evidence from Rural India" Journal of Political Economy, 97 (4): 905-926

| Table 1a: Baseline Household Descriptive Statistics (ABC) | | | |
|---|---|---|---|
| | **ABC** Mean | **Non-ABC** Mean | **Diff (s.e.)** |
| Age | 37.86 | 37.18 | 0.69 (.77) |
| Head of Household (1=Yes, 0=No) | 0.56 | 0.55 | 0.01 (.03) |
| Farmer is respondent's main occupation | 0.80 | 0.79 | 0.01 (.03) |
| Housewife is respondent's main occupation | 0.18 | 0.19 | -0.01 (.02) |
| Number of household members | 8.42 | 8.33 | 0.09 (.25) |
| Affected by drought in past year | 0.61 | 0.64 | -.031(.056) |
| Percent Children <15 with some primary education | 0.10 | 0.09 | 0.01 (.01) |
| Number of asset categories owned | 4.97 | 4.99 | -0.01 (.11) |
| Number of houses owned | 3.18 | 3.12 | 0.06 (.13) |
| Own mobile phone (1=Yes, 0=No) | 0.30 | 0.30 | 0.0 (.03) |
| Respondent has access to mobile (in HH or village) | 0.79 | 0.76 | 0.03 (.02) |
| Used mobile phone since last harvest (1=Yes, 0=No) | 0.54 | 0.57 | -0.03 (.03) |
| Number times used mobile phone since last harvest | 6.67 | 7.26 | -0.59 (.47) |

Notes: Table displays summary statistics for treatment (Column 1) and control group (Column 2). Column 3 reports the difference. ***, **, * denote statistically significance at 1, 5, 10 percent, respectively.

**Table 1b: Baseline Household Descriptive Statistics: Zap**

| | Cash average | Zap-Cash | Placebo-Cash | Zap-Placebo |
|---|---|---|---|---|
| | Mean (s.d.) | Coeff (s.e.) | Coeff (s.e.) | Coeff (s.e.) |
| Age of respondent | 34.32 | 0.37 | -2.29* | 2.66* |
| | | (1.60) | (1.36) | (1.50) |
| Respondent is household head | 0.13 | 0.05 | -0.00 | 0.05 |
| | | (0.04) | (0.03) | (0.04) |
| Farmer is respondent's main occupation | 0.02 | 0.012 | -.006 | 0.018 |
| | | (0.01) | (0.01) | (0.01) |
| Housewife is respondent's main occupation | 0.81 | 0.003 | 0.02 | -0.02 |
| | | (0.03) | (0.03) | (0.03) |
| Number of household members | 9.34 | -0.64 | -0.40 | -0.24 |
| | | (0.62) | (0.46) | (0.56) |
| Number of asset categories owned | 3.59 | -0.04 | -0.18 | 0.14 |
| | | (0.17) | (0.17) | (0.17) |
| Number of houses owned | 2.3 | 0.08 | -0.24 | 0.32** |
| | | (0.16) | (0.15) | (0.12) |
| Own mobile phone | 0.29 | -0.01 | -0.06 | 0.05 |
| | | (0.04) | (0.05) | (0.05) |
| Respondent has access to mobile phone | 0.92 | -0.02 | -0.014 | -0.02 |
| | | (0.02) | (0.02) | (0.01) |
| Respondent has used mobile phone since last harvest | 0.63 | -0.02 | -0.05 | 0.03 |
| | | (0.05) | (0.05) | (0.05) |
| Household experienced drought in past year | 0.99 | -0.00 | 0.01 | -0.01 |
| | | (0.01) | (0.01) | (0.01) |

Notes: This table presents a comparison of individual and household covariates in each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (cash) households, whereas Columns 2 and 3 show the average difference between the different treatments and the cash households. Column 4 shows the average difference between the zap and placebo treatment households. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 2a: Baseline Difference in Labor Mobility: ABC

| | ABC Mean | Non-ABC Mean | Coeff (s.e.) |
|---|---|---|---|
| **Panel A: Pooled Sample** | | | |
| Respondent migrated in past year | 0.09 | 0.12 | -.026(.021) |
| Household had one member who migrated | 0.43 | 0.44 | -.005(.040) |
| Number of household members who migrated | 0.66 | 0.72 | -.062(.081) |
| Percentage of household members who migrated | 0.08 | 0.08 | -.003(.010) |
| Percentage of active household members who migrated | 0.19 | 0.19 | -.003(.020) |
| Household member migrated within Niger | 0.44 | 0.55 | -.112*(.065) |
| Household member migrated within West Africa | 0.52 | 0.40 | .12*(.07) |
| **Panel B: Dosso** | | | |
| Respondent migrated in past year | 0.07 | 0.10 | -.036(.024) |
| Household had one member who migrated | 0.52 | 0.53 | -.009(.047) |
| Number of household members who migrated | 0.91 | 0.87 | .041(.104) |
| Percentage of household members who migrated | 0.10 | 0.09 | .006(.012) |
| Percentage of active household members who migrated | 0.22 | 0.21 | .021(.025) |
| Household member migrated within Niger | 0.48 | 0.56 | -.080(.084) |
| Household member migrated within West Africa | 0.63 | 0.47 | .173**(.082) |
| **Panel C: Zinder** | | | |
| Respondent migrated in past year | 0.11 | 0.13 | -.019(.035) |
| Household had one member who migrated | 0.35 | 0.33 | .015(.054) |
| Number of household members who migrated | 0.41 | 0.55 | -.137(.094) |
| Percentage of household members who migrated | 0.06 | 0.07 | -.010(.014) |
| Percentage of active household members who migrated | 0.15 | 0.17 | -.023(.030) |
| Household member migrated within Niger | 0.36 | 0.52 | -.152(.101) |
| Household member migrated within West Africa | 0.33 | 0.28 | .054(.10) |

Notes: Table displays summary statistics for ABC (Column 1) and non-ABC (Column 2). Column 3 reports the difference. Standard errors in parenthesis do not adjust for clustering at the village level. ***, **, * denote statistically significance at 1, 5, 10 percent, respectively. Summary statistics are for respondents with non-missing information

**Table 2b: Baseline Difference in Labor Mobility: Zap**

| | Cash average | Zap-Cash | Placebo-Cash | Zap-Placebo |
|---|---|---|---|---|
| | Mean | Coeff | Coeff | Coeff |
| | (s.d.) | (s.e.) | (s.e.) | (s.e.) |
| Respondent migrated in past year | 0.00 | 0.00 | -0.00 | 0.00 |
| | | (0.00) | (0.00) | (0.00) |
| Household had one member who migrated | 0.49 | 0.01 | 0.01 | -0.01 |
| | | (0.06) | (0.05) | (0.05) |
| Number of household members who migrated | 0.64 | 0.05 | 0.06 | -0.01 |
| | | (0.10) | (0.08) | (0.10) |
| Percentage of household members who migrated | 0.07 | 0.01 | 0.01 | 0.00 |
| | | (0.01) | (0.01) | (0.01) |
| Household member migrated within Niger | 0.11 | -0.01 | 0.02 | -0.03 |
| | | (0.04) | (0.04) | (0.04) |

Notes: This table presents a pre-treatment comparison of individual and household outcomes in each of the different treatment areas. Column 1 shows the mean and s.d. of the basic treatment (cash) households, whereas Columns 2 and 3 show the average difference between the different treatments and the cash households. Column 4 shows the average difference between the zap and placebo treatment households. Heteroskedasticity-consistent s.e. clustered at the village level are presented in parentheses. *** significant at the 1 percent level, ** significant at the 5 percent level, * significant at the 10 percent level.

Table 3a: Effect of Mobile Phones on Labor Mobility: DD for 2009 Cohort (ABC)

| Dependent variable | Respondent migrated | Household member migrated | Number of household members migrated | % of household members migrated | % of active household members who migrated |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| ABC*Time | -0.002 | 0.072* | 0.166* | 0.021** | 0.042* |
| | (0.03) | (0.04) | (0.09) | (0.01) | (0.02) |
| ABC | -0.003 | -0.020 | -0.078 | -0.005 | -0.009 |
| | (0.03) | (0.04) | (0.10) | (0.01) | (0.03) |
| Time | 0.022 | 0.045 | 0.029 | -0.008 | -0.008 |
| | (0.02) | (0.03) | (0.06) | (0.01) | (0.02) |
| Drought | Yes | Yes | Yes | Yes | Yes |
| Region fixed effects | Yes | Yes | Yes | Yes | Yes |
| Sub-regional fixed effects | No | No | No | No | No |
| Mean of comparison group | 0.176 | 0.403 | 0.573 | 0.079 | 0.178 |
| Number of observations | 1,077 | 1,089 | 1,090 | 1,090 | 1,090 |
| $R^2$ | 0.021 | 0.043 | 0.056 | 0.025 | 0.022 |

*Notes:* ABC villages are the villages in which traditional literacy training was complemented by mobile-phone based literacy training. The results are for data pooled for the 2009 cohort in January 2009 and January 2010. The sub-region level was the level of randomization between ABC and across cohorts. ***, **, * denote statistically significance at 1, 5, 10 percent, respectively. Robust standard errors clustered at the village level.

Table 3b: Effect of Mobile Phones on Labor Mobility: DD (Zap)

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | **Cash average** | **Zap-Cash** | **Placebo-Cash** | **Zap-Placebo** | **Zap-Both** |
| *Dependent variables* | Mean (s.d.) | Coeff (s.e.) | Coeff (s.e.) | Coeff (s.e.) | Coeff (s.e.) |
| Respondent migrated | 0.00 | 0.00 | -0.00 | 0.00 | 0.00 |
| | | (0.00) | (0.00) | (0.00) | (0.00) |
| Household member migrated | 0.49 | 0.09** | 0.06* | 0.02 | 0.06** |
| | | (0.03) | (0.04) | (0.02) | (0.02) |
| Number of household members migrated | 0.64 | 0.20** | 0.19** | 0.01 | 0.11 |
| | | (0.09) | (0.09) | (0.08) | (0.08) |
| Percentage of household members who migrated | 0.07 | 0.03*** | 0.03*** | 0.00 | 0.02* |
| | | (0.01) | (0.01) | (0.01) | (0.01) |

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

**Table 4a: Heterogeneous Effects of Mobile Phones on Labor Mobility (ABC)**

| Dependent variable | Respondent migrated | Household member migrated | Number of household members migrated | % of household members migrated | % of active household members who migrated |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Baseline Assets* ABC*Time | 0.00 | 0.04 | 0.14** | 0.01** | 0.02 |
| | (0.01) | (0.03) | (0.06) | (0.01) | (0.01) |
| ABC*time | -0.01 | -0.16 | -0.59** | -0.04 | -0.06 |
| | (0.07) | (0.14) | (0.29) | (0.03) | (0.06) |
| Baseline Assets*Time | 0.00 | -0.01 | -0.00 | -0.01* | -0.01 |
| | (0.01) | (0.02) | (0.03) | (0.00) | (0.01) |
| Drought | Yes | Yes | Yes | Yes | Yes |
| Region fixed effects | Yes | Yes | Yes | Yes | Yes |
| Sub-regional fixed effects | No | No | No | No | No |
| Mean of comparison group | .170 | .42 | .641 | .085 | .195 |
| Number of observations | 524 | 532 | 532 | 532 | 532 |
| $R^2$ | 0.00 | 0.01 | 0.02 | 0.01 | 0.01 |

*Notes:* ABC villages are the villages in which traditional literacy training was complemented by mobile-phone based literacy training. The results are for data pooled for the 2009 cohort in January 2009 and January 2010. The sub-region level was the level of randomization between ABC and across cohorts. ***, **, * denote statistically significance at 1, 5, 10 percent, respectively. Robust standard errors clustered at the village level.

**Table 4b: Heterogeneous Effects of Mobile Phones on Labor Mobility: DD (Zap)**

| | (2) | (3) | (4) |
|---|---|---|---|
| | Household member migrated | Number of household members migrated | % of household members migrated |
| Baseline Assets*Zap*Time | 0.01 | 0.16** | 0.00 |
| | (0.02) | (0.06) | (0.01) |
| Mobile*time | 0.01 | -0.45** | 0.01 |
| | (0.08) | (0.18) | (0.02) |
| Baseline Assets*Time | 0.00 | 0.00 | 0.00 |
| | (0.00) | (0.00) | (0.00) |
| Drought | Yes | Yes | Yes |
| Mean of comparison group | .42 | .641 | .085 |
| Number of observations | 1,097 | 1,097 | 1,097 |
| $R^2$ | 0.00 | 0.02 | 0.01 |

*Notes:* Zap villages are villages which received the zap treatment. Baseline assets include all assets categories owned before the program. ***, **, * denote statistically significance at 1, 5, 10 percent, respectively. Robust standard errors clustered at the village level.

Table 6a. Mobile Phone Usage by Treatment Status

| | Diff | s.e. |
|---|---|---|
| **Panel A: Mobile Phone Ownership and Usage** | | |
| Individual owns a mobile phone | 0.04 | 0.05 |
| Respondent has access to a mobile phone | 0.05 | 0.06 |
| Used mobile phone since last harvest | -0.91 | 1.12 |
| Number times used mobile phone since last harvest | 3.18 | 4.13 |
| Made calls | 0.07 | 0.06 |
| Received calls | 0.03 | 0.05 |
| Wrote SMS | 0.11*** | 0.03 |
| Received SMS | 0.06** | 0.03 |
| Beeped | 0.05 | 0.07 |
| Received a beep | 0.11** | 0.05 |
| Transferred credit | .029* | 0.02 |
| Received credit | 0.04 | 0.04 |
| **Panel B: Uses of Mobile Phones for Communications with Migrants** | | |
| Communication with migrant via mobile phone | 0.05 | 0.12 |
| Number of times communicated with migrant since last harvest | 0.53** | 0.24 |
| Communicate with family/friends inside Niger | 0.13** | 0.06 |
| Communicate with commercial contacts inside Niger | 0.07 | 0.05 |
| Communicate with family/friends outside Niger | -0.05 | 0.07 |
| Communicate with commercial contacts outside Niger | 0.02 | 0.02 |
| Remittance received as income | 0.03 | 0.04 |
| Amount of last remittance received (CFA) | 5528 | 7607 |
| Used mobile phone to Communicate with family | 0.03 | 0.04 |
| Used mobile phone to Communicate death/ceremony | 0.00 | 0.06 |
| Used mobile phone to share general information | 0.01 | 0.07 |
| Used mobile phone to ask for help/support | 0.02 | 0.02 |

Notes: Data based upon the household survey data collected in January 2009 and January 2010 including 1,038 observations. The coefficient is the coefficient on an ABC variable in January 2010. "Beeping" is using a ring without completing a call to signal another individual to call. Standard errors are clustered at the village level *, **, *** denote statistically significant at 10, 5 and 1 percent levels, respectively.

**Table5b: Impact of Program on Mobile Phone Ownership and Usage**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | **Cash average** | **Zap-Cash** | **Placebo-Cash** | **Zap-Placebo** | **Zap-Both** |
| | Mean | Coeff | Coeff | Coeff | Coeff |
| *Dependent Variables* | (s.d.) | (s.e.) | (s.e.) | (s.e.) | (s.e.) |
| ***Panel A: Mobile Phone Ownership and Usage*** | | | | | |
| Respondent owns a mobile phone | 0.25 | 0.71*** | 0.53*** | 0.18** | 0.37*** |
| | | (0.07) | (0.08) | (0.09) | (0.07) |
| Respondent has access to a mobile phone | 0.99 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | (0.00) | (0.00) | (0.00) | (0.00) |
| Used mobile phone since last harvest | 0.63 | 0.31*** | 0.13** | 0.18*** | 0.25*** |
| | | (0.05) | (0.05) | (0.05) | (0.04) |
| Made calls | 0.29 | 0.33*** | 0.21*** | 0.12* | 0.22*** |
| | | (0.06) | (0.06) | (0.06) | (0.06) |
| Received calls | 0.98 | -0.04 | -0.01 | -0.03 | -0.03 |
| | | (0.03) | (0.03) | (0.04) | (0.03) |
| Wrote SMS | 0.01 | 0.00 | 0.02** | -0.02** | -0.01 |
| | | (0.01) | (0.01) | (0.01) | (0.01) |
| Received SMS | 0.01 | 0.01 | 0.02** | -0.01 | 0.00 |
| | | (0.01) | (0.01) | (0.01) | (0.01) |
| Beeped | 0.06 | 0.15*** | 0.06** | 0.09*** | 0.12*** |
| | | (0.03) | (0.03) | (0.03) | (0.03) |
| Received a beep | 0.03 | 0.11*** | 0.06** | 0.06** | 0.09*** |
| | | (0.03) | (0.03) | (0.03) | (0.02) |
| Transferred credit via Zap | 0.00 | -0.00 | -0.00 | -0.00 | -0.00 |
| | | (0.01) | (0.01) | (0.01) | (0.01) |
| Received credit via Zap | 0.01 | 0.45*** | 0.01 | 0.44*** | 0.44*** |
| | | (0.06) | (0.02) | (0.06) | (0.06) |
| ***Panel B: Uses of Mobile Phones for Communications with Migrants*** | | | | | |
| Communicated with migrant since last harvest | 0.58 | -0.14** | -0.10* | -0.04 | -0.09* |
| | | (0.06) | (0.06) | (0.06) | (0.05) |
| Communicated with family/friends inside Niger | 0.24 | 0.18*** | 0.13** | 0.04 | 0.11* |
| | | (0.06) | (0.05) | (0.06) | (0.06) |
| Communicate with commercial contacts inside Niger | 0.00 | -0.00 | 0.01 | -0.01 | -0.01 |
| | | (0.01) | (0.01) | (0.01) | (0.01) |
| Communicate with family/friends outside Niger | 0.46 | 0.01 | 0.03 | -0.02 | 0.00 |
| | | (0.07) | (0.07) | (0.07) | (0.06) |
| Communicate with commercial contacts outside Niger | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 |
| | | (0.01) | (0.01) | (0.01) | (0.01) |
| Used mobile phone to Communicate with family | 0.92 | -0.10** | -0.00 | -0.09** | -0.09*** |
| | | (0.04) | (0.03) | (0.04) | (0.03) |
| Used mobile phone to Communicate death/ceremony | 0.27 | 0.16*** | 0.15*** | 0.00 | 0.08* |
| | | (0.05) | (0.05) | (0.05) | (0.04) |
| Used mobile phone to share general information | 0.59 | 0.03 | 0.07 | -0.04 | -0.00 |
| | | (0.06) | (0.06) | (0.07) | (0.06) |
| Used mobile phone to ask for help/support | 0.27 | 0.08 | 0.07 | 0.01 | 0.05 |
| | | (0.05) | (0.05) | (0.05) | (0.04) |
| Received remittance as income | 0.35 | 0.09** | 0.04 | 0.05 | 0.07** |
| | | (0.04) | (0.04) | (0.04) | (0.03) |
| Amount of last remittance received | 22057 | -423 | 2,163 | -2,586 | -1,277 |
| | | (3,446.00) | (2,524.51) | (3,147.21) | (3,059.44) |

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

**Figure 1. Impact of Mobile Phone Provision on Labor Mobility Outcomes**

| Hypothesis | Effect |
|---|---|
| H1: Expected returns in migration areas do not outweigh costs | Introduction of mobile phones should have no effect on migration |
| H2: Mobile phones provide information about employment and earnings | Introduction of mobile phones should increase migration by assisting households in better job matching |
| H3: Mobile phones alleviate credit constraints to migrating | Introduction of mobile phones should increase migration for poorer households |
| H4: Mobile phones reduce insurance market failures in destination markets | Introduction of mobile phones should reduce costs in migration destination |

Figure 2. Study Timeline for ABC and Zap Interventions

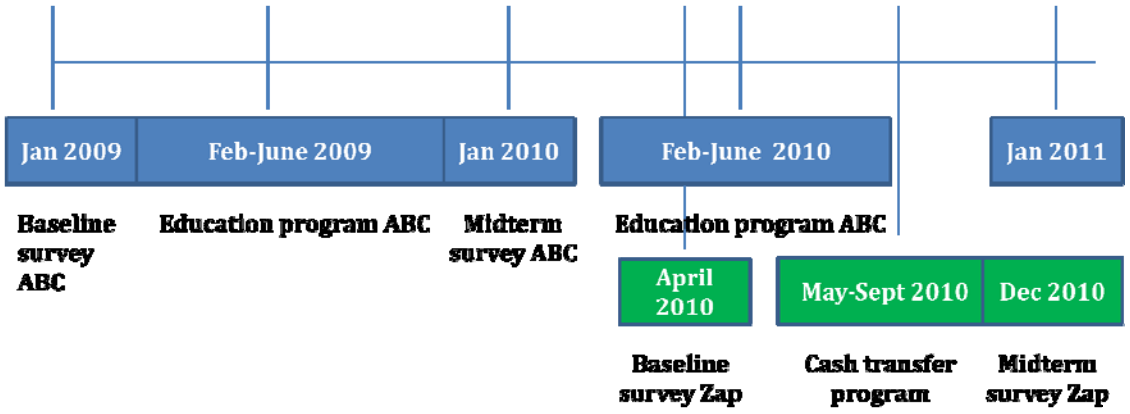

Figure 3. Study Areas of ABC and Zap Programs