The impact of mobile financial services in low- and lower-middle-income countries

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Contents

List of abbreviations

CGAP	Consultative Group to Assist the Poor
HH	Households
ICT	Information and communication technology (ICT)
IMTFI	Institute for Money, Technology and Financial Inclusion (IMTFI)
MFI	Microfinance institutions
MNOs	Mobile-network operators
P2P	Person-to-person
SME	Small and Medium Enterprise

Abstract

There has been considerable optimism regarding the use of mobile phones as a medium for reaching the unbanked, given the growth in access to, and ubiquity of, mobile phones in developing countries and the development of mobile phone-based financial services. In recent years, there has been a lot of investment in technologies using mobile phones to deliver financial services, as well as naturally concomitant discussion of the potential benefits for the poor and unbanked.

This systematic review was conducted to determine the impact of mobile financial services in respect of the following review questions:

- What is the impact of mobile financial services on the volume and frequency of remittances?
- What is the impact of mobile financial-service use on the consumption habits of the poor?
- What is the impact of mobile financial-service use on livelihoods in terms of productivity and income?

Relevance to research and policy

Mobile money is a relatively new technology, which was introduced at the turn of the century. Some recent reviews (e.g. Duncombe and Boateng 2009) have called for more empirical investigation of the impact of mobile financial services on development. This systematic review addresses this call, and investigates the empirical evidence. Furthermore, this systematic review provides a starting point for further research into mobile financial services, so that comparable studies can be developed towards a meta-analysis of mobile-money services, as they continue to be implemented around the world.

The results of the systematic review can help inform policy-makers in respect of integrating mobile money into the delivery of services, whether in payments systems, conditional cash transfers, or in salary distribution.

Methodology

We use explicit systematic review methods to identify, select, and critically appraise evidence pertaining to the research questions. This paper attempts to provide an unbiased assessment of the impact of mobile financial services and the research into the subject.

The systematic review involved searching through grey literature and electronic databases, using a set of inclusion and exclusion criteria. To be included, studies had to be published after 2000, be conducted on low- and low middle-income countries, be about mobile money, involve the use of mobile phones, and report a quantitative measure of short-term (e.g. frequency and volume of remittances, consumption of goods, etc.) and long-term (e.g. savings, livelihoods) impact. Screening and extracting key information and the findings of the studies were undertaken by two people from the team, and disagreements were decided by a third screener. The same process was followed when conducting the final quality assessment of the shortened list of papers that underwent a full review.

This systematic review identified 2,759 studies at the search stage and included ten studies for synthesis.

Results

Four studies in Africa have demonstrated significantly higher volumes of remittances received among m-financial service users compared to non-users. M-money as an intervention also leads to greater savings, although the overall difference is not statistically significant ($Z = 1.81$, $p = 0.071$).

In cases where it has been used for cash transfers in farm inputs, m-money has been found to be significantly responsible for a 54% increase in farm-inputs consumption compared to non-users. This has also contributed to an increase in household income and farm yield sold.

Implications

Given that all the studies that appear in this systematic research were published after 2011, it is apparent that the call for more empirical evidence on the impact of m-financial services (Duncombe and Boateng 2009) has been heeded. However, going by the small number shown here, much remains to be done. Some of the results are positive, but remain inconclusive, and, as such, further research is required. There are also clear gaps in terms of where the studies have been conducted. Most locations are in Africa, and in Kenya, whereas research in Latin America and Asia is not, as yet, represented. This is problematic, considering how widespread m-financial services now are, and their continued implementation worldwide.

1. Background

Lack of access to financial services can exclude people with need for capital (Johnston and Murdoch 2008). More inclusive financial systems can help the poor smooth the flow of their finances and insure themselves against economic vulnerability owing to illness, accidents, theft and unemployment. It could allow them to save and borrow, build their assets, and make investments that can improve their livelihoods (World Bank 2012). It can also improve people's credit-risk profiles, which can lower the prices they must pay for financial services, reducing personal stress, and helping them to gain access to lower-cost sources of credit (Caskey 2002). Hence, improving access to financial services is important for development, because it can facilitate economic growth and help reduce income inequality.

However, over half of the world is unbanked, and does not use formal financial services to save and borrow (Chala et al. 2009). This was reiterated in a more recent World Bank (2012) study, which reported that only around half (51%) of the world's adult population held accounts with a formal financial institution. This figure is lower in middle-income countries (43%) and in low-income countries (23%) (World Bank 2012).

Given the growth in access to mobile phones in developing countries, there had been considerable optimism regarding the use of mobile phones as a medium for reaching the unbanked, particularly through the development of mobile phone-based financial services. In 2009, for instance, it was reported that 1bn people were without access to banks, but had access to mobile phones, with this figure projected to grow to 1.7bn by 2012 (Pickens 2009).

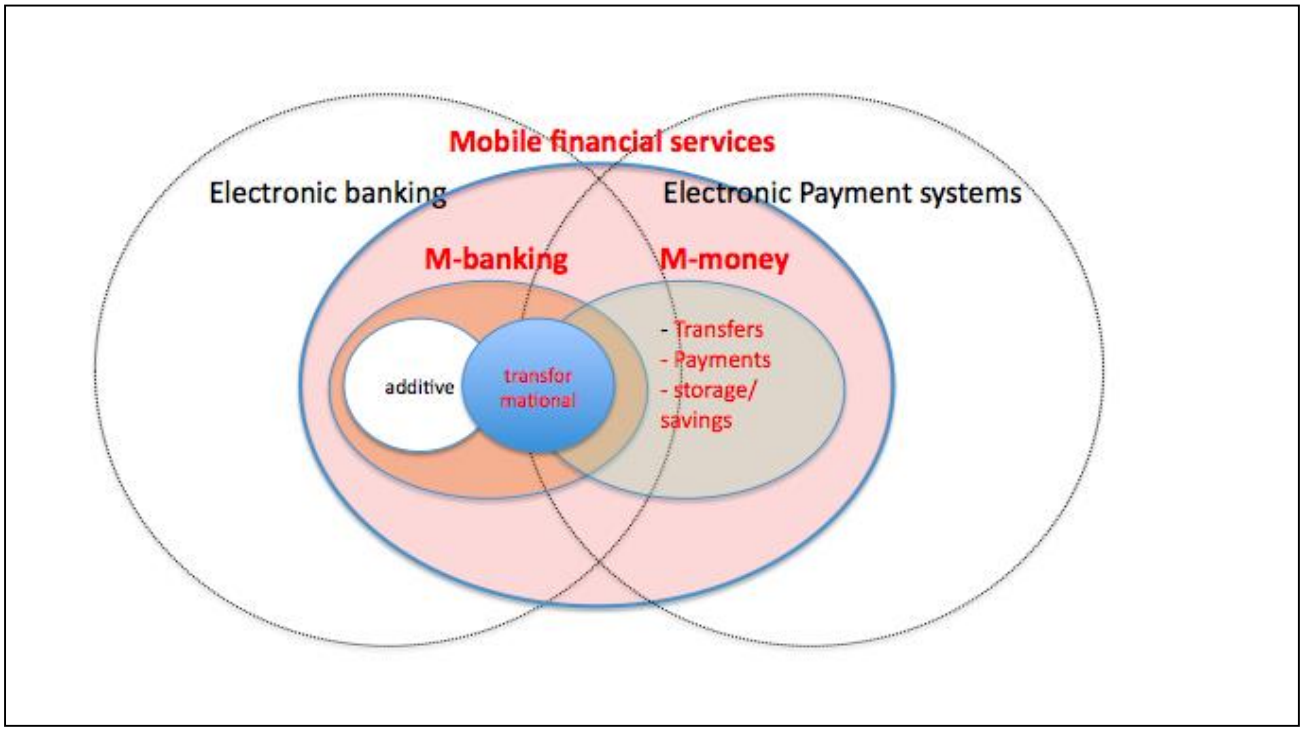
In recent years, there has been a lot of investment in technologies that use mobile phones to deliver financial services, together with discussion of the potential benefits for the poor and unbanked (Porteous 2006, Porteous and Wishart 2006, Vodafone 2007, Bangens and Soderberg 2008). Among the foreseen benefits of using mobile financial services is the ability to transfer funds at a distance, particularly small amounts of money, at a lesser cost compared to other alternatives available to the poor. Moreover, there was also an assumption that, by providing financial services to the unbanked via mobile-phone networks, the poor may benefit from improved savings rates, increased income and resilience to financial shocks, among other benefits (Donner and Tellez 2008). This intervention was expected to broaden access to, and reduce the cost of offering, formal financial services, while also increasing the efficiency of payment systems, and reducing reliance on cash as a transactional medium (Porteus 2006).

Before discussing the emerging evidence on the impact of mobile financial services, the succeeding sections briefly describe the intervention and the underlying assumptions in respect of how it has impacted development.

1.1 Description of the intervention

Mobile financial services cover a broad range of financial activities that people use or access through their mobile phones (Boyd and Jacob 2007:6). These include mobile banking services (m-banking) and mobile money (m-money) use in money transfers and payments, among others (GSMA 2008) (See Figure 1).

Figure 1: Locating m-financial services in the electronic banking and electronic payment space



M-banking is considered to be a form of electronic banking. Electronic banking (e-banking) involves "the provision of retail and small-value banking products and services through electronic channels (e.g. deposit taking, lending, account management, the provision of financial advice, electronic bill payment and the provision of other electronic payment products and services, such as electronic money) (Basel 1998:3). In turn, m-banking is defined as: "financial services delivered via mobile networks and performed on a mobile phone." (Bångens and Söderberg 2008:7)[1] Mobile banking is also further classified as either being *additive* or *transformational* (Porteous 2006). Additive m-banking is an additional channel through which existing clients may access banking services. Transformational m-banking is intended for use by clients who are unbanked, and is meant to integrate them into the formal banking system (Bångens and Söderberg 2008)

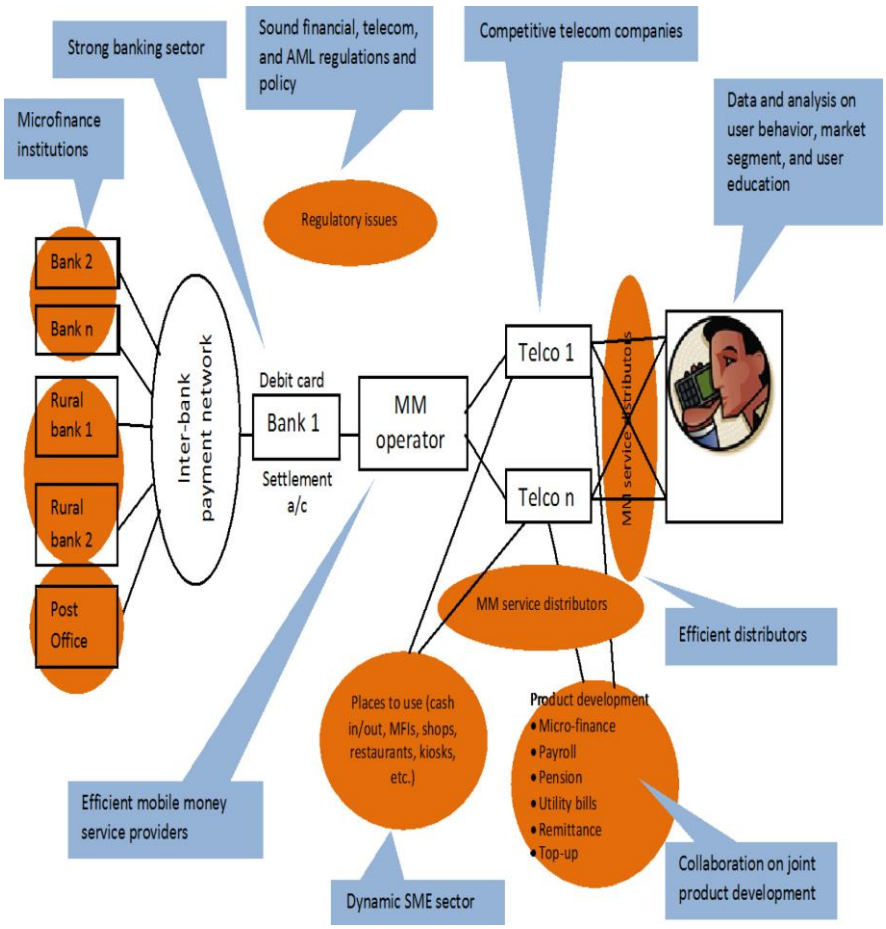
If m-banking is a form of electronic banking, so is m-money a form of electronic money. Electronic money refers to "stored value or prepaid payment mechanisms for executing payments via point of sale terminals, direct transfers between two devices, or over computer networks, such as the Internet. Stored value products include hardware or card-based mechanisms (electronic purses or wallets), and software or network-based cash (also called digital cash)" (Basel 1998:3-4). Hence, new electronic-payment systems based on the mobile phone are now more commonly referred to as "mobile money", especially since the first Mobile Money Summit held in 2008 (Maurer 2012). M-money refers to

[1] However, "These services may or may not be defined as banking services by the regulator, depending on the legislation of the country in question, as well as on which services are offered." (Bångens and Söderberg 2008:7)

“services that connect consumers financially through mobile phones. Mobile money allows for any mobile-phone subscriber — whether banked or unbanked — to deposit value into their mobile account, send value via a simple handset to another mobile subscriber, and allow the recipient to turn that value back into cash, easily and cheaply” (GSMA 2009:7). In this way, m-money can be used for both transfers (m-money transfer) and payments (mobile payments). As such, m-banking and m-payments sometimes overlap in the literature, particularly regarding the banked. For instance, Porteus (2006), while describing m-payments as financial transactions undertaken using mobile devices, also includes them among the broad range of services provided through mobile banking.

The mobile financial service ecosystem is composed of many stakeholders. It includes mobile-network operators (MNOs), banks, m-money cash-in/cash-out agents, retailers, microfinance institutions (MFIs), employers, civil society organizations, donors, and, of course, end-users (Jenkins 2008) (see Figure 2).

Figure 2: Sample mobile financial Ecosystem (Jenkins 2008, sourced from IFC)



Given the many actors involved, the set-up of these deployments varies between countries. Lyman et al. (2008), for instance, initially observed two distinct models: (1) bank-led and (2) non-bank led. Others have also noted variations in how the banks, telecommunication operators and other partners work together in the deployment of mobile-banking services (Goswami and Raghavendran 2009, Porteus 2006). These

variations illustrate the extent of the innovation occurring worldwide in respect of the delivery of mobile financial services, partly due to the differences in the country contexts in which they are deployed (Alampay 2009).

In a recent Unbanked Global Mobile Money Adoption Survey, it was reported that there are currently 150 live m-money deployments in 72 countries, with 41 deployments launched in 2012 alone (Penicaud, 2013). Eighty-two million customers are registered globally, of whom 30m have active accounts. Furthermore, 61% of the volume of m-money transactions are airtime top-ups, and 82% of the value of transactions are person-to-person (P2P) transfers. Of the various mobile financial-system deployments, however, only six have could accumulate more than 1m active customers (Hanouche and Rotman 2013).

The uses for mobile financial services are also diverse and expanding. They can allow individuals to deposit, send, and withdraw funds using a mobile phone, as well as pay for goods and services (Jack and Suri 2011, Mendes et al. 2007), with the more common services being domestic and international remittances (Jenkins 2008). Given the expanding applications, varied models and contexts, it was mentioned at the first m-money summit in 2008 that no-one knows what the mobile financial ecosystem will look like in five years (Jenkins 2008). Likewise, Donner and Tellez (2008) have said that the norms and expected behaviours surrounding mobile financial services will evolve over time and differ from place to place

It is from this premise that this systematic research proceeds.

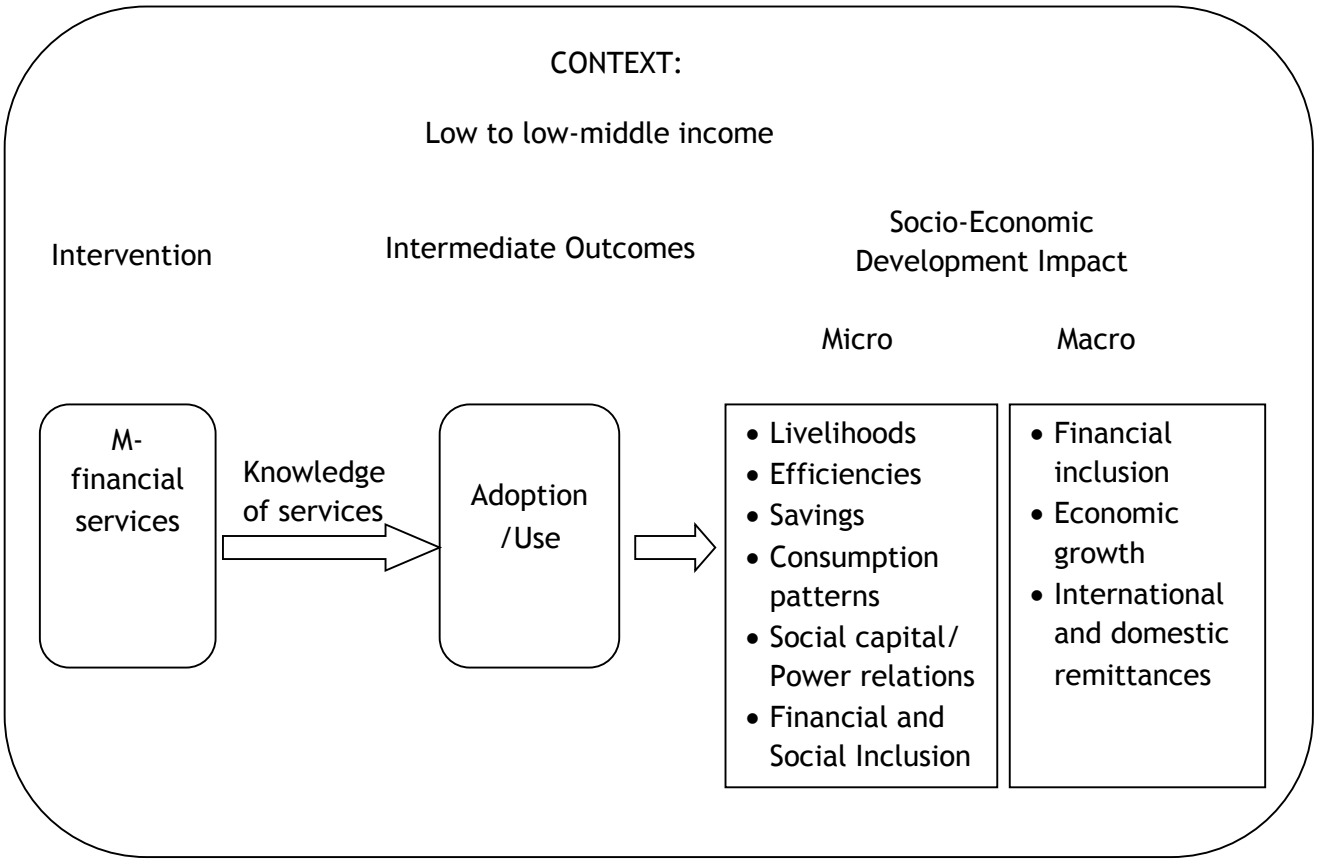
1.2 Theoretical framework

Since the mobile infrastructure today is more widespread than the traditional financial system, there is greater access to the former than to the latter. By using the mobile network as a medium, the main value proposition for mobile financial services is the ability to send money more easily, cheaply and securely (Jenkins 2008). To this extent, a mobile financial service as an intervention is expected to:

- enable poor households (HH) to access salient financial instruments and, therefore, pools of funds
- reduce the cost of conducting financial transactions such as borrowing/saving/remitting
- enable HHs to have more freedom to participate in the formal financial landscape, and, therefore, markets

This expected effect is illustrated in Figure 3:

Figure 3: Theoretical Framework



The premise is that, as m-financial services are introduced, their adoption will be dependent on people's knowledge of and access to the services, and their perceived relevance. There will be people who will adopt and use them because of the previously mentioned advantages (greater access to funds, greater security, lower costs, etc.).

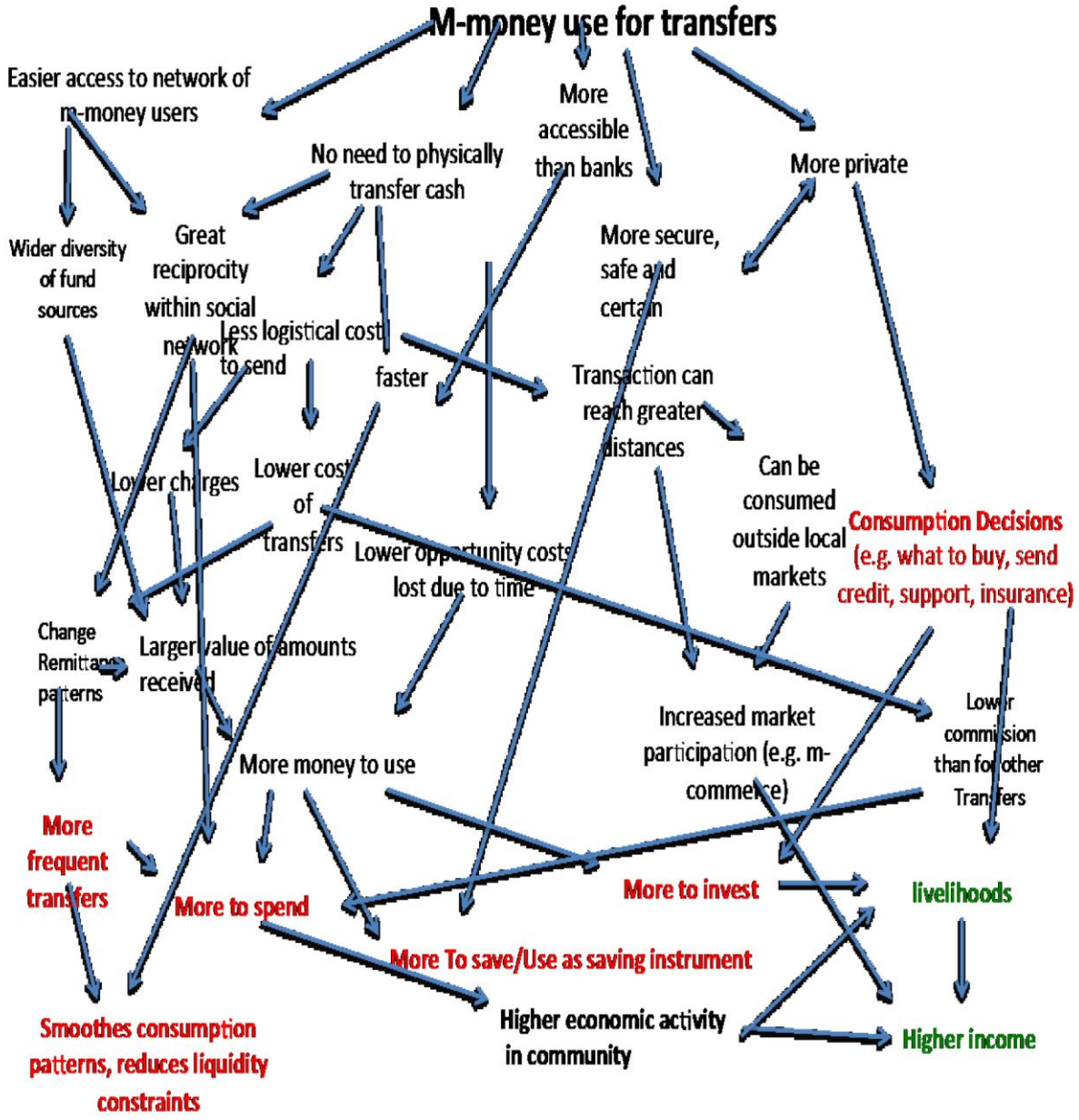
The question this systematic review investigates is whether there is evidence that using m-financial services has contributed to the achievement of the aforementioned goals, and, therefore, to larger developmental objectives. This can happen if efficiencies lead to more funds becoming available for consumption, investments or savings. Also, if being connected provides increased access to funds from the network itself, and, hence, facilitates more stable sources of money. These advantages may be more pronounced in a developing-country context, where access to financial services and banks, in particular, is more problematic.

Behavioural changes in terms of financial transactions and banking, and use of the mobile financial services in particular, must be contextualized in terms of the cultural, technological, infrastructural and regulatory differences between countries. At the same time, there may be different uses for m-money, as people may subvert, innovate, and repurpose the medium (Maurer 2012). Eventually, it is expected that m-financial services will be used to stimulate economic activity in communities and increase investment, leading to more employment and, potentially, higher incomes. Hence, its impact can be seen in terms of socio-economic benefits for individual users and the local community.

1.3 Theory of change in related research

The effect of mobile phones on financial inclusion has been illustrated in some recent studies. For instance, Adrianaivo and Kpodar (2012: 21) have seen a positive and significant relationship between mobile-phone penetration and financial inclusion, and growth in African countries. This relationship is developed not only by facilitating financial inclusion, but also by strengthening the link between financial inclusion and growth.

Figure 4: Mapping the Theory of Change



As for m-money, which is defined broadly as the provision of financial services through a mobile-phone network, there has been much discussed in respect of its potential impact, given the range of services to which it has been applied (see Donovan 2012). In some instances, m-money has also been used as a medium for conditional cash transfers. Aker et

al. (2011) found that the privacy that m-money provides in respect of when cash transfers are received results in greater diversity in respect of the range of goods purchased by the beneficiaries, leading to less asset depletion and more variety in crop growth by beneficiaries. In addition, mobile money has been used as a means for transacting in online commerce, and has enabled people without access to credit cards to buy, sell and transact online using social-network sites in the Philippines (Alampay 2008b).

Figure 4, above, illustrates some of the theories of change discussed in the literature. M-money, for instance, is seen as enabling households to reach out to networks outside the immediate family, and across greater distances, thereby increasing access to credit and the volume of insurance transactions (Jack et al. 2013). Also, when households are affected by a shock, it allows them to share and reduce the impact by providing them with more frequent remittances, in larger amounts (Jack and Suri 2014). Furthermore, the adoption of m-money can increase the frequency of mobile transfers, decrease the use of informal saving arrangements, and lead to increased demand for banking services (Mbiti and Weil 2011). Also, some qualitative studies have reflected on the impact of m-money services, especially in East Africa. For instance, Morawczynski and Pickens (2009) found that M-PESA users in Kenya were using the service as an interim storage device to accumulate lump sums of money for unexpected consumption shocks (such as funeral costs), thereby altering existing savings patterns. There is more detailed evidence for this in Ghosh (2012), who found that low-income rural populations in Uganda were using their m-money wallets as interim storage devices in three different ways: i) as a kind of transaction account, where people used their m-money wallets for short-term savings; ii) as an on-going savings account, where people either built up a reserve before remitting it, or depleted an incoming remittance over time; and iii) for targeted savings, where people built up a lump sum in their wallets with a specific goal in mind. Morawczynski and Pickens (2009), moreover, found that the income of their sample increased from 5% to 30% since the initial adoption of the service. Finally, they observed that M-Pesa was empowering rural women in Kenya, by making the process of soliciting cash from their husbands much simpler. In fact, when their husbands refused to remit money (usually as a reflection of the gender power imbalance), these rural women were able to reach out to other contacts with much more ease. In the same realm, and in a very nuanced article, Donovan (2012) questioned the impact of M-Pesa on human freedom, and provided a complex answer: while the use of M-Pesa has helped many Kenyans accomplish their goals, it lays bare the rise of a potentially dominant entity that might enable new forms of control, compulsion, and “unfreedom”.

Figure 5: Expected outcomes and impact of access to m-financial services

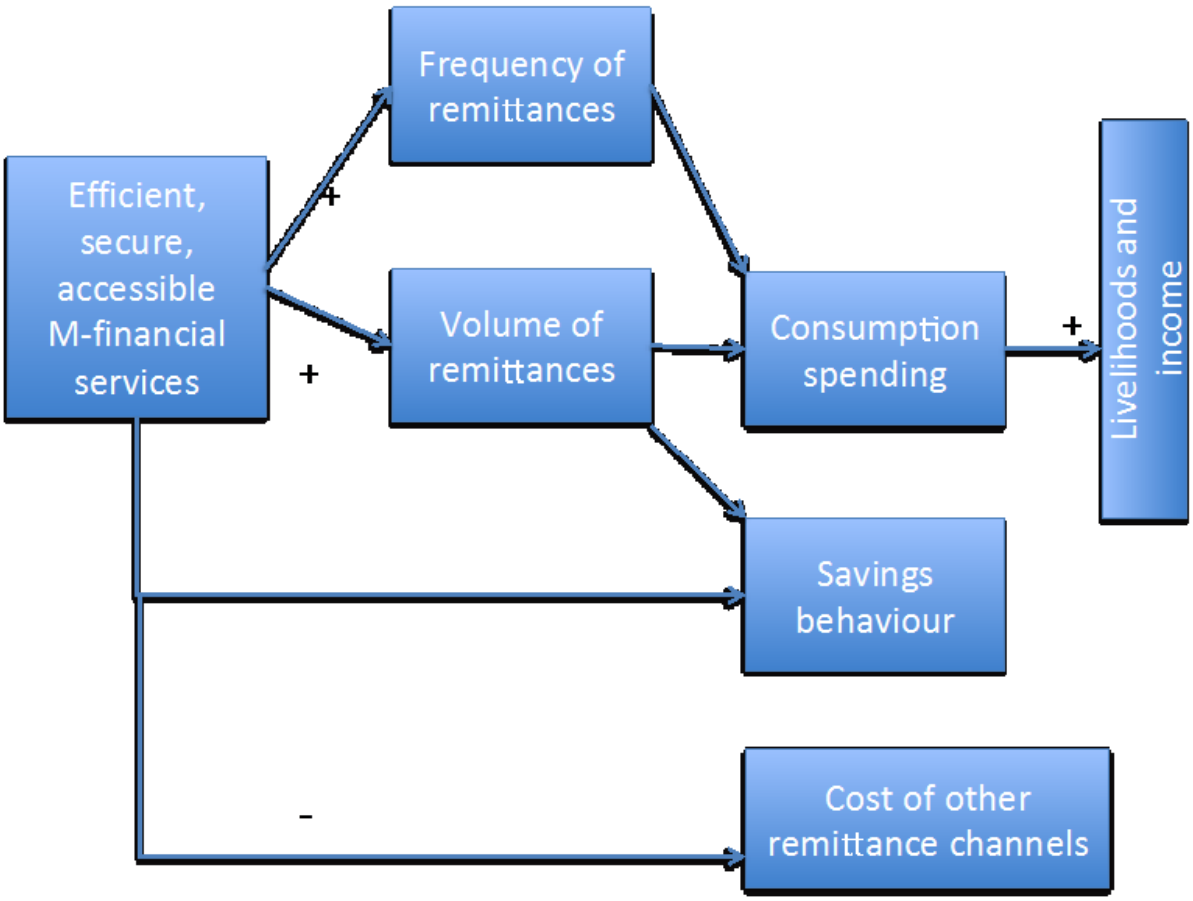


Figure 5 synthesizes the expected effect of using m-money, as illustrated in Figure 4. It is assumed that the use of m-money provides efficiency gains, whether through easier access, speedier access, or lower costs of transfers. This then leads to immediate outcomes, such as more frequent remittances, and/or more frequent remittances. Intermediate outcomes that can result from this impact on how the remitted money is used. This may be in terms of how it is spent, and the portion of it that is saved. More long-term outcomes pertain to how the expected increase in remittances and change in use patterns lead to impact on livelihoods, such as investment in businesses, participation in markets, and increased income as a result.

These kinds of impact, particularly on volume and frequency of remittances (impact on savings, impact on consumption, etc.), will be the focus of the research and will be presented in a meta-analysis in the later sections of this report.

1.4 Review questions

This systematic review synthesizes the evidence of its impact that is available in low- and middle-income countries.

The systematic review provides answers to the following research questions:

a. What is the impact of mobile financial services on the volume and frequency of remittances?
b. What is the impact of mobile financial-service use on the consumption habits of the poor?
c. What is the impact of mobile financial-service use on livelihoods in terms of productivity and income?

1.5 Authors, funders and other users of the review

This systematic review was commissioned by LIRNEasia.

The review was undertaken by Erwin Alampay (EA), Goodiel C. Moshi (GM), Ishita Ghosh (IG), Mina Peralta (MP) and Juliana Harshanti (JH). The team collaborated in developing the study protocol, and divided the task of selecting the various studies for inclusion. This was achieved through double screening, with conflicts resolved by a third reader. EA and MG led the quantitative-effectiveness synthesis and compiled the overall systematic review report.

2. Methodology

This chapter discusses the approach used in conducting the systematic review. The review only included quantitative-research studies that document the impact of m-financial services in low- and low-middle-income developing countries, as classified by the World Bank in 2014 (see Appendix 4.1).

2.1 Study selection criteria

The systematic review was premised on the following inclusion criteria, which informed how the computer-aided search of electronic databases was to proceed (see Table 1). Computer-aided search here refers to an automated search conducted with the help of an information-science/library-science specialist. Prior to this, the team conducted a manual search of online grey literature.

2.1.1 Defining relevant studies: Inclusion and exclusion criteria

Table 1: Inclusion criteria

PICOS	Description
Population and context	*Eligible participants* included individuals or households, living in low- or lower middle-income countries. Geographical location: Low and lower middle-income countries in 2014 (see Appendix 2.1) Individuals: Any age group, any gender, any ethnicity, any income group Households: Rural or urban Macro: Studies that provide quantitative data comparisons between countries; within-country regional quantitative comparisons
Intervention	*Eligible interventions* were those identified as "mobile financial services", and which refer, to the use of m-money via mobile-phone networks. Mobile financial services that explicitly use the mobile phone: transformative m-banking for the unbanked; m-money-based transfers; m-money payments; use of m-money for conditional cash-transfer programmes
Comparisons (any one of these)	Urban vs rural Intervention group vs control group Country comparisons (m-money-systems integration) M-money users versus non-users
Outcomes	All outcomes reported were eligible for the review.

	Primary outcomes were remittance outcomes, including volume and frequency of transfers. *Secondary outcomes* included how these transfers were used (e.g. savings, investments, consumption); and intermediate outcomes, including farmer knowledge and adoption of practices. Purely qualitative studies were excluded. Economic outcomes Individual/HH: Change in financial behaviours (remittances/savings, consumption/expenditure patterns); Livelihoods (efficiency gains, transaction costs, access to new markets; productivity, income change) Community: Economic indicators of growth, financial inclusion; remittance flows Macro: Country-level indicators of financial inclusion; economic growth
Secondary outcomes	Social outcomes Individual/HH: gender/power relations/family connectedness
Study design	*Eligible study designs* for the impact of mobile financial services were measurable using counterfactual impact evaluations, including experimental or quasi-experimental study designs and methods of analysis. Experimental (e.g. randomised controlled trials; controlled trials) Quasi-experimental designs (panel studies, difference in difference, propensity score matching) Longitudinal studies (time series, panel studies, regression) Natural experiment where the counterfactuals have been addressed *Comparisons* eligible for this review were individuals and households who received no intervention, or did not use m-money for a similar application or service for the period studied.
Date, language and form of publication	English language studies 2000-14 Academic journals Theses and dissertations Grey literature (no institutional publications) - sourced

2.1.2 Identification of potential studies: search strategy

A comprehensive search strategy was implemented to search the literature for qualifying studies (see Appendix 2.2). The search strategy for the review included conducting the search through academic publications and bibliographic databases (e.g. Econlit (Ovid), Business Source Premier from EBSCO, CAB Abstracts, Public Affairs Index, Web of Science (WoS search), ToC (Table of Content) Premier from IDRC, Proquest dissertation (UK and US), Scopus). The automated search to extract relevant titles and abstracts and generate an initial list from these databases was done with the help of an information scientist, John Eyers. The automated search was conducted from April to May 2014.

The team also conducted a manual grey literature search from ICTD and m-money for development-related websites (e.g. Consultative Group to Assist the Poor (CGAP); Institute for Money, Technology and Financial Inclusion (IMTFI)). Further, searches were also conducted using a forward citation search of the references and bibliographies of the relevant studies, particularly with recent reviews (e.g. Duncombe and Boateng 2009). The reviewers also used personal contacts to look for relevant primary studies.

A grey literature search was conducted in various online databases, using the keywords 'mobile money', 'm-money', 'm-financial services', 'm-Banking', 'branchless banking' and 'mobile money impact'. This included searches of various databases, including Google Scholar, SSRN, databases of GSM Association, FinMark, Microsave, Financial Sector Deeping; FAO, USAID; IDRC; DFID, SPIDER, ADB; IMF; World Bank, and Information and communication technology (ICT)-related conferences such as ICTD, ICA, IDIA, and other databases such as the Millennium Challenge, IMTFI, CGAP, US/Canada/UK Theses. The manual and grey literature searches were conducted between February and April 2014. However, subsequent grey literature was also added from peer recommendations, up to as recently as April 2015.

To search the electronic databases, the keywords that were utilised for the searches were formulated based on its population, intervention, and comparisons (See Table 2). Combinations (or permutations) of the keywords was used to identify relevant studies (see Appendix 2.2). The search of these sources was limited so as to identify studies conducted from 2000 onwards.

Table 2: Search terms

Population	Intervention	Comparison
All low-income and lower middle-income countries as per the World Bank Classification 2012[2]	m-bank/ mbank/ m bank/e-bank/ ebank/ e bank/ m-money / mmoney/ m money/ e-money / emoney/ e money/ e-payment/ epayment/ e payment/ m-payment/ mpayment/ m payment/ m-transfer/ mtransfer/ m transfer/ m-financial / mfinancial/ m financial/ m-transaction/ mtransaction/ m transaction/ m-pesa/ mpesa / m pesa/ Gcash/ smart money/ WIZZIT	Urban-rural/control-intervention/between countries

[2] http://data.worldbank.org/about/country-classifications/country-and-lending-groups

An excel database was set up to keep track of any coding studies found during the review. Titles and abstracts were imported and entered manually into the first of these databases.

2.1.3 Screening studies: applying inclusion and exclusion criteria

The Inclusion criteria were used to generate an initial result through the electronic search that was performed on ECONLIT, CAB_EBSCO, Cab Abstr, Business Source, EBSCO, TOC Premier, Public Affairs Index, and WOS Search, using various iterations of the concept (m-money, m-banking, m-financial services).

Subsequently, exclusion criteria were applied successively to (i) titles and abstracts and (ii) full reports. The exclusion criteria applied the following:

1. Exclude publications before 2000
2. Exclude high-income and middle income (not in Annex 10)
3. Exclude not using mobile phones
4. Exclude papers not on mobile money
5. Exclude not on impact
6. Exclude theoretical only
7. Exclude if qualitative only
8. Exclude only feasibility/potential

The exclusion criteria were applied manually by the team, wherein a study was removed if any of the above criteria applied to the study or paper being assessed. In applying the exclusion criteria, a double-screening of titles was undertaken. Any conflicts or disagreements were resolved through a third screener. A second round of screening was then conducted on the abstracts of the titles that passed the initial screening.

Subsequently, full reports were obtained for those studies that appear to meet the criteria or where there was insufficient information based on the abstract alone. These full-document reports were entered into the EPPI-Reviewer 4.0 systematic review software (Thomas et al 2010). The inclusion/exclusion criteria were re-applied to the full reports and those that did not meet these initial criteria were excluded.

Three independent reviewers (EA, GM, IG) from the team assessed the full text papers against the inclusion criteria, and final decisions on what to include in the final list were made collectively.

2.1.4 Assessing quality of studies and weight of evidence for the review question

A critical appraisal to assess the quality of studies was undertaken by three people, and final decisions on what to include were taken collectively. The critical appraisal involved assessing the papers in respect of possible risk of bias and quality of the research design. Data were extracted from the studies that passed the critical analysis. All team members participated in the extraction of data, as a way of validating results.

Critical assessment also involved evaluating for risk of bias that can lead to threats to internal validity (causal identification), and for external validity (generalisability). The

assessment of risk of bias in included studies was based on the checklist below (Waddington and Hombrados 2012):

1. Sampling bias for cross-section studies: How representative is the conducted survey and what population is represented?
2. Mechanism of assignment: Was the allocation or identification mechanism able to control for selection bias?
3. Group equivalence: Was the method of analysis executed adequately to ensure comparability of groups throughout the study, and prevent confounding?
4. Hawthorne and John Henry effects: Was the process of being observed causing motivation bias?
5. Spill-overs: Was the study adequately protected against performance bias?
6. Selective outcome reporting: Was the study free from outcome-reporting bias?
7. Selective analysis reporting: Was the study free from analysis-reporting bias?
8. Was the study free from other sources of bias?

(see Appendix 2.5)

Data were then extracted from the final list of papers. All team members were asked to extract data from all the papers, to allow for cross comparison. For the quantitative synthesis, the group extracted effect-size estimates from included studies, calculating standard errors and 95% confidence intervals, using the data provided in the studies, where possible. Effect sizes could only be computed if more than one study measured the same outcome measure.

2.1.5 Synthesis of evidence

The inclusion criteria for this study required quantitative designs to afford the possibility of conducting meta-analysis on the final list of studies. Data were extracted from the final list of studies that satisfied the inclusion/exclusion criteria, as well as the appraisal of the quality of research design. The intervention across studies involved primarily the introduction of m-money use, whether by direct adoption, or thru use in the delivery of social services, such as conditional cash transfers. However, studies included variations on the impact variables investigated. For the most part, impact variables from qualified studies were concentrated in four main categories: consumption, saving, efficiency and volume of transactions, as well as income. The selection of these variables was based on the desire to explore empirically the impact of m-money in developing countries. For each study that qualified for inclusion on the final list, the effects were collected, together with the direction of the effect (positive or negative) and measure of statistical significance. These measures were then used to calculate the effect size to be included in the meta-analysis for a summary effect size. Across all studies, the household is the unit of analysis; however, studies were implemented in various countries.

According to Borenstein, Hedges, Higgins and Rothstein (2009), three factors are important when selecting an effect size index for meta-analysis. First, the index should guarantee comparability of effect sizes across all studies to be included in the meta-

analysis; second, information provided in each study should be sufficient for calculating the effect size of that index from all studies; and, third, the effect size resulting from the index should be meaningfully interpretable. As it is common for synthesis studies to be comprised of various study designs, there was a mismatch in data reported in studies and, consequently, a lack of important data, which limited the synthesis from using a standardized mean method. Instead, the response ratio method was used to calculate comparable effect size and the corresponding standard errors (SE(RR)), from heterogeneous studies for meta-analysis.

Meta-analysis was applied by estimating the average effects of mobile financial services or m-money on each outcome with at least two studies. Given the fact that this synthesis included studies that cover the entire area of developing countries, a huge variation is expected in socio-economic conditions, which act as background to the impact of mobile financial services. Taking this fact into consideration, a random-effects meta-analysis model was adopted, to allow for various effect sizes for each study, depending on the underlying socio-economic conditions.

3. Identifying and describing studies: results

3.1 Results of the screening

The electronic search that was conducted from April to June 2014 yielded 2,759 hits. The initial title screening reduced this number to 205 cases, which then underwent abstract screening, which was conducted separately from 88 abstracts obtained from the grey literature search. The second screening also involved double reviews, which further cut the number, by almost half, to only 109 papers, along with 22 other papers considered from the grey-literature search. Excluding once more the overlaps from the grey literature and electronic lists, there were 102 unique articles that were considered for full-text screening and critical analysis (see Figure 6).

3.2 Studies included from searching and screening

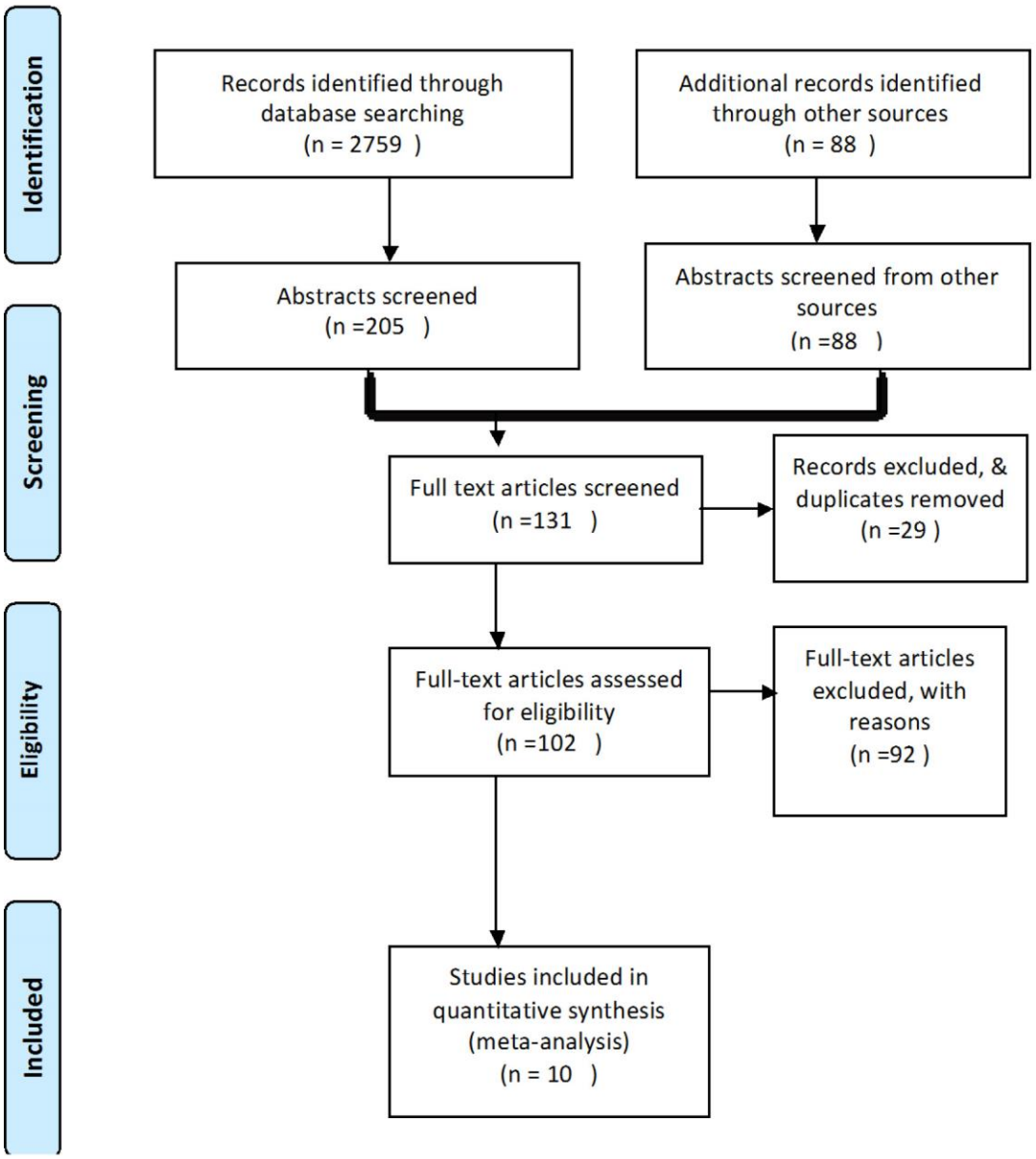
During the full-text screening, some papers were also excluded based solely on whether they complied with the inclusion criteria, and these were not assessed for risk of bias (see Appendix 2.5). Following critical analysis, a final list of ten (10) papers was evaluated and data were extracted from these.

There were two more noteworthy papers published in 2015 that came in after the electronic and original grey-literature searches were conducted, but these were ultimately excluded due to risk of bias. They are noteworthy because they come from Latin America (Mexico) and Asia (Afghanistan), and the final list of 10 are all from Africa.

It should be noted that the units of analyses were individuals, households and communities. The SR did not consider the impact of m-money on organizations (including businesses and SMEs), as this was the scope of another systematic review, and its expected impact in terms of operational efficiencies did not correlate with the outcomes that were included in this review. Nonetheless, some of the studies in the final list still touched on the efficiency gains related to its use.[3]

[3]A notable paper that was included in the SR on mobiles' impact on SMEs was a Master's thesis by Laura Frederick (2014) Impact of mobile money usage on microenterprise: evidence from Zambia.

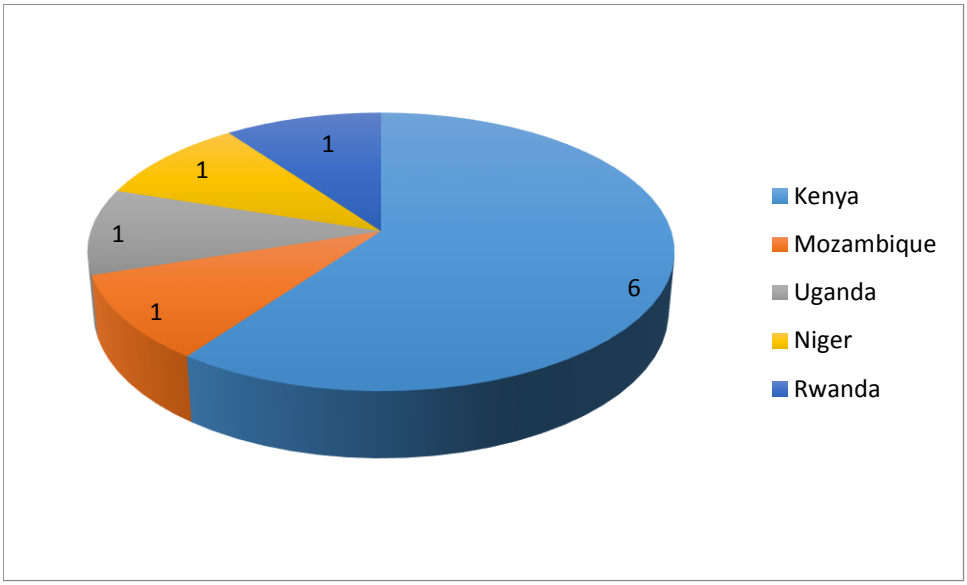
Figure 6: Filtering of papers from searching, screening to synthesis



3.3 Characteristics of the included studies (Systematic Map)

Of the final list of ten papers considered, all were published after 2011, with all studies on m-financial services in Africa (see Figure 7, below). Sixty percent (60%) were studies of M-Pesa in Kenya. The absence of papers from Latin America may partly be a function of the exclusion of Spanish-language papers, which was a limitation of this SR. Noteworthy as well was the dearth of empirical m-money research from Asia, which might also be a limitation of restricting the search to purely English-language studies.

Figure 7: Geographical dispersion of final list of papers (n =10), codes are mutually exclusive



3.4 Main characteristics of studies included in the synthesis

This section briefly summarizes the final set of papers that were included in the meta-analysis Aker, et.al. 2011, Mbiti and Weil 2011, Bemombyne and Thegeya 2012, Batista and Vicente 2013, Jack et al. 2013, Kirui, et al. 2013, Jack and Suri 2014, Kikulwe et al. 2014; Munyegera and Matsumoto 2014), starting with the six papers from Kenya, and followed by four papers from other countries in Africa. It will also discuss other noteworthy papers that were not included in the final list.

Much of the literature on m-money discusses the M-PESA service in Kenya. Some of the studies look at observable primary impact in respect of the effect on remittance support (Jack et al. 2013, Jack and Suri 2014, Mbiti and Weil 2011), on savings practices, and demand for banking services (Mbiti and Weil 2011, Demombyne and Thegaya 2012), and also on livelihoods and income (Kikulwe et al. 2014, Kirui et al. 2013).

Jack et al. (2013), for example, looked at the introduction of M-PESA in Kenya, and how it enabled households to reach out to both friends and relatives outside the immediate family, across greater distances, for expansion of credit and insurance transactions. In particular, they measured the impact of m-money on routine family support, credit remittance, and remittance for emergency purposes or insurance, based on panel survey data from 2008 to 2009. A subsequent paper by Jack and Suri (2014) looked at how the m-money service enables households, when affected by a shock, to share the risks by receiving remittances from more extensive social networks that cover larger areas. More specifically, the study looked at how m-money lowers the risk for households through the volume and frequency of remittances. Mbiti and Weil (2011), in contrast, combined multiple sources of data, including micro-level survey data from FinAccess, and applied regression analysis to a panel of respondents. They looked at how the adoption of m-money increased the frequency of mobile transfers, decreased the use of informal saving

arrangements, and increased the demand for banking products. They also looked at how M-PESA impacts the prices of competing services and the frequency of remitting funds.

Linking m-money to the issue of savings, and as a means for the unbanked to gain access to more banking services, is one of the reasons for the excitement surrounding mobile financial services in general. Demombyne and Thegaya (2012) investigated whether the features of m-money (e.g. limited applications, not as liquid as cash, and less conspicuous because it is hidden from others) leads to more savings. Indirectly, this echoes some of Aker et al.'s (2011) findings about privacy's providing control of how money transfer is used (be it for consumption or savings).

However, Kikulwe et al. (2014) also used survey data, but focused on a sample of small holder farmers in Kenya, who were receiving cash transfers for agricultural use. It is one of the few studies that investigate how m-money use impacts on livelihoods. Their investigation was based on the premise that m-money increases remittances received and this can increase use of farm inputs/technology. In turn, this can lead to a rise in sales of outputs, which, in turn, results in increased farm profit. In addition, this contributes to more employment down the line. In aggregation, the above mechanisms are assumed to help increase household income. Another study that is connected to livelihoods was performed by Kirui et al. (2013). They also studied M-PESA use in Kenya, but this was done through a natural experiment. They investigated whether the adoption of the service enabled farmers to access more funds for buying agricultural inputs, sell a larger proportion of their farm output, and whether this, in turn, increased their farm income.

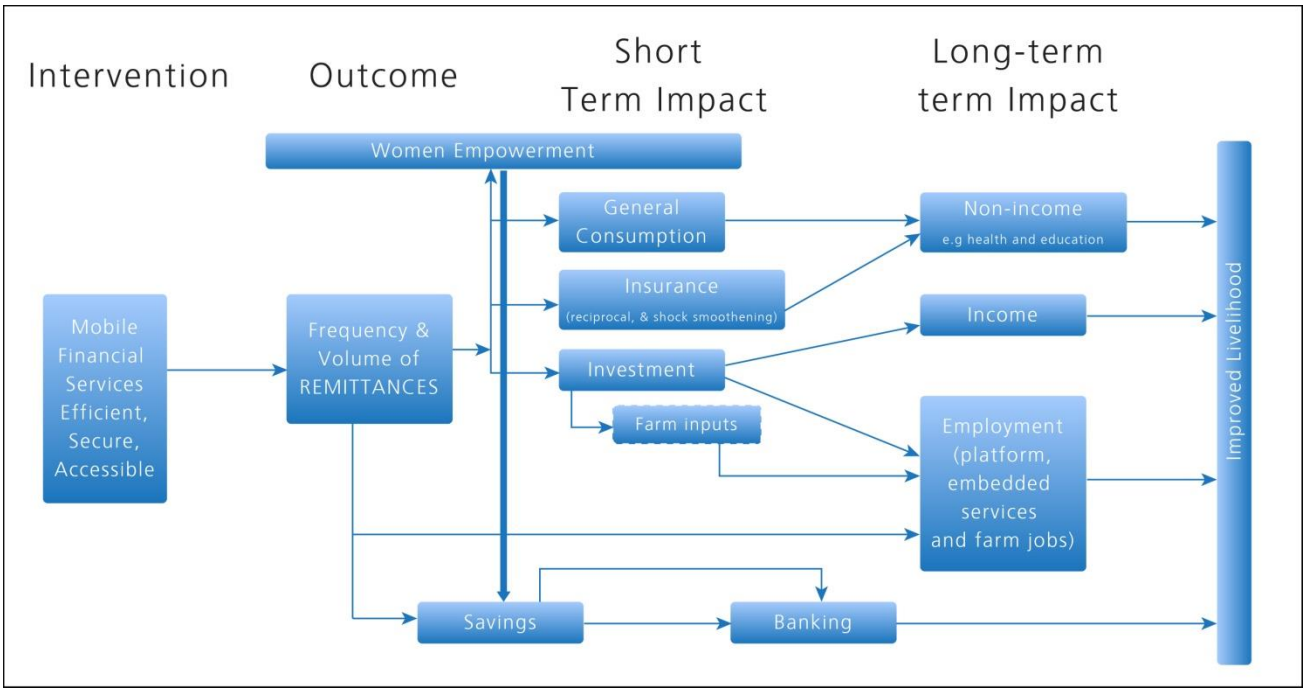
Empirical studies of other m-money services being rolled out in other countries are also being seen. Aker et al. (2011), for instance, looked at a mobile cash-transfer system in Niger called Zap. They used an experimental design in studying the short-term impact (over eight months) of using mobile cash transfers for conditional cash-transfer programmes in Niger. They found that m-money intervention reduced funders' distribution and recipient's collection costs, provided more privacy for the transfer, and, potentially, affected intra-household decision-making, which led to the observed outcome differences on consumption choices. Batista and Vicente (2013), in contrast, looked at the introduction of the Mkesh m-money programme in Mozambique. In their case, the primary intervention they looked at was on training a target group of people to use the technology. Their design was experimental, and they still looked at secondary outcome effects on consumption and investment. Blumenstock et al. (2014) also looked at risk sharing, this time using the case of Rwanda, immediately after the country had suffered an earthquake. M-PESA is also being adopted in other African countries; Munyegera and Matsumoto (2014) looked at panel evidence from Uganda, comparing household M-PESA users with household non-users. They also looked at whether the adoption of m-money increases flows of remittances, especially from individuals working in cities who send money to their families, and also whether this increases levels of household consumption.

4. In-depth review: Results

In scanning through the ten papers, there were several themes that emerged regarding the impact of m-financial services (see Appendix 4.1 for the Summary Results Table). These include themes regarding remittances, savings, consumption and investment, income, credit, commercialization, employment and banking.

The figure, below, illustrates the general pattern of how m-financial services lead to these outcomes and how they relate to each other.

Figure 8: Outcome and Impact of m-financial services



4.1 Synthesis of evidence

BOX 1: Operational efficiency gains

While the organizational impact of using m-money is not, per se, a concern for this systematic review, it is, nevertheless, worth mentioning that some of the papers here tackle the impact of m-money use in this respect. Some of the studies also document gains to the organization implementing a cash-transfer programme using m-money, whether these be for conditional cash transfers (see Aker et al. 2011), or for salaries (see Blumenstock et al. 2015).

Aker et al. (2011) estimated that manual distribution of cash transfers are 30% more expensive than using Zap (note that this benefit accrues to the agency delivering the service). For the funding organisation, the intervention reduced the variable cost of the operation by 30% over the period and, for recipients, individuals in Zap villages travelled an average roundtrip of 0.9 km, compared with 4.04 km in cash/placebo villages ($p<0.01$), equivalent to an opportunity cost saving of 30 minutes per transfer. However, Blumenstock et al. (2015) argued that some of these savings are actually simply being transferred or shifted to either the employee/individual or the money-transfer agent.

Mobile financial services are assumed to be more efficient and secure than alternative systems for sending and receiving money, provided they are present and accessible (see Box 1). They could then lead to more frequent remittances, and more funds. More funds and access to money can then lead to possible differences in how these are used, whether for general consumption related to basic needs, or for investment, or savings that could, in turn, lead to banking. Further down the line, this is expected to impact employment, income and livelihoods.

Meta-analysis, however, could not be applied to all these reported impacts, since not all the studies measured the same thing, or operationalized them in the same way. Meta-analysis could be carried out only on secondary outcomes (savings, consumption, informal loans, income and farm yield sold), and not on the primary outcomes in terms of remittances (volume and frequency).

The evidence of impact on individuals and households is discussed below.

A. PRIMARY OUTCOMES: Impact on remittances

Many of the studies that were included look at remittance flows that result from the adoption of m-financial services. The impacts investigated pertain to frequency (and direction of flows receiving/sending), volume, and diversity of remittance sources.

Frequency

The findings suggest that M-PESA users participate in more remittance activity than non-users (Munyegera et al. 2014, Jack and Suri 2013, Mbiti and Weil 2011). For instance, the Jack and Suri (2013) study in Kenya reported that, in respect of frequency of remittances from 2008-09, m-money users were likely to experience 2.024 more transactions ($p<0.01$) compared to non-m-money users, and using a mobile financial service in Kenya increases the likelihood of receiving and sending remittances by 37.4% and 34.3% (Jack and Suri 2013), respectively. Mbiti and Weil (2011:16) reported the positive relationship between

mobile financial service (M-PESA) adoption and frequency of sending and receiving transfers in Kenya, while also reporting that only the estimate for sending transfers was found to be statistically significant.

Assumptions in respect of the relationship between adoption and non-adoption was supported by Munyegera et al. (2014). In their study in Uganda, they reported a 56% difference between users and non-users in terms of frequency of remittances received. However, while Aker et al. (2012) reported that the frequency and amount of remittances from people with mobile phones with Zap were higher than those without the service, they found no statistically significant difference between these two groups.

Volume

As far as volume of remittances is concerned, Jack and Suri (2013) reported KsH.33.1 and 32.6 higher amounts of remittance sent and received by households who used M-PESA in Kenya ($p<0.01$ for both) than for those who did not use M-PESA. Also in Kenya, Kikulwe et al. (2014) reported that m-money users in rural households received KSh.12,697 more than non-user households (equivalent to 66%, $p<0.05$)

Similarly, Munyegera and Matsumota (2014), in comparing users to non-users, saw a 43% rise in terms of the total value of remittances they received ($p<0.01$).

However, Blumenstock et al. (2014) noted that airtime transfers also increase during shocks. However, this study has some limitations, given that the change could have simply been owing to the shock, and not a function of m-money. More specifically, the study could not explicitly distinguish airtime-transfer effect from that of competing alternatives during the shock. This is important, because there might be cases when other money-transfer channels were used. Consequently, understanding their effect is important to capture the effect of airtime transfer in terms of the overall amount of money transferred to areas that experienced the shock, as well as service users and non-users.

In the experiment conducted by Batista and Vicente (2013) in Mozambique, the reported volume of remittances among targeted individuals of their intervention was no different to untargeted treated individuals. However, in this case, what was being investigated was more the intervention of helping people to use m-financial services (Mkesh in this case), rather than the m-financial service itself.

Distance travelled (of remittances) during shocks

There were several studies that looked at the remittance flows via m-money during shocks (Aker et al. 2011, Blumenstock and Fafschamps 2014). These situations allowed for opportunities to observe differences, whether the intervention was through cash-transfer interventions (e.g. agricultural interventions during droughts) or through possible changes in flows going to individuals and households in general.

Blumenstock and Fafschamps (2014) hypothesized that those from outside the community were more likely to remit during a shock, largely because they were unaffected, unlike those within the same community. This is not necessarily a function of the impact of m-money; however, m-money is likely to amplify this effect, since it offers a convenient platform for money transfers.

Aker et al. (2011), however, found no significant difference between the owner of a mobile phone and an individual who had a mobile phone using m-ZAP, in terms of whether

they would communicate following a shock. Hence, the possibility of asking for assistance might be more due to being connected by the mobile network, rather than the m-money service itself.

Diversity of remittance sources/destination/direction

Jack et al. (2013) reported that 21% of their transactions were "reciprocal" (which they defined as meaning that two-way flows are more likely to be observed (2013:357), compared to only 11% for non-users). Jack et al. (2013:359) reported that it was 13.2% more likely for m-money users to engage in at least one short-term reciprocal transfer (defined as a reciprocal transfer within one short-term round) than for non-user households to do so. One can speculate that, to some extent, these short-term reciprocal exchanges are short-term credit that is being repaid.

Blumenstock and Fafschamps (2014) also considered reciprocal relationships and distance as possible factors, especially in times of shocks (e.g. earthquakes). In these instances, remittances were sent over greater geographical distances, but were more likely to be made by wealthy individuals, and they showed that the flow came to those with a history of strong reciprocal exchange. In other words, they found that an individual who had used more airtime in the past received more help from their network during the period after the shock.

B. SECONDARY OUTCOMES: Impact on savings, consumption and investments

Savings

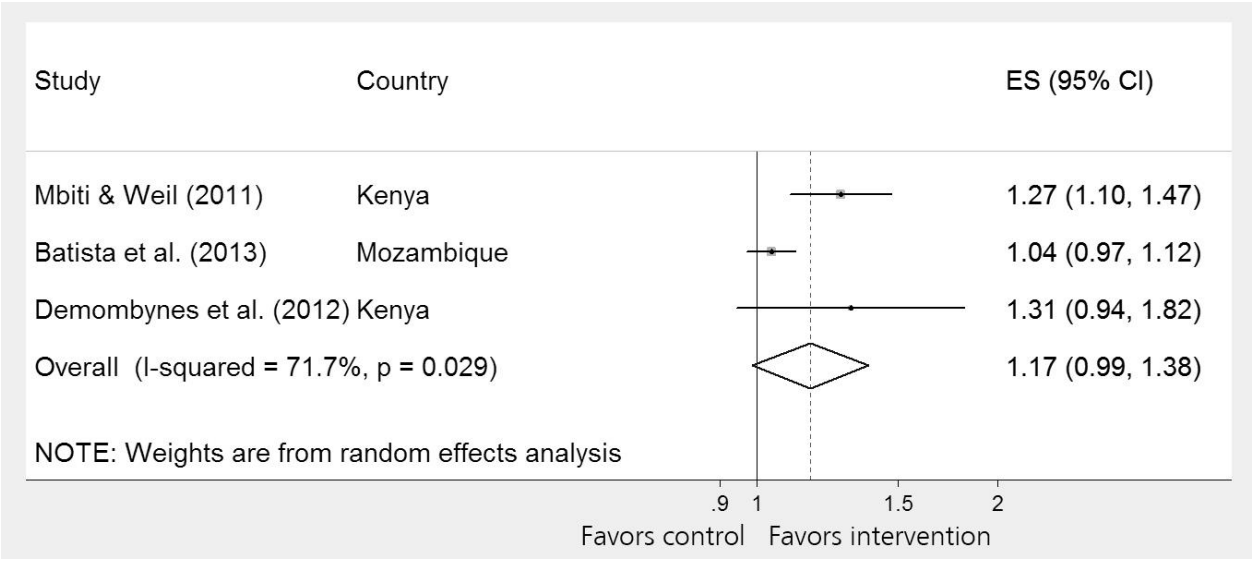
Three studies looked at the impact of m-money on saving (Mbiti and Weil 2011, Batista and Vicente 2012, Demombyne and Thegaya 2012). The savings effects in these studies are relatively heterogenous (I^2 = 71.1%, p = 0.05).

As far as using M-PESA as an instrument for savings is concerned, Mbiti and Weil (2011) stated that 35% of banked individuals in Kenya use M-PESA to save, while only 19% of the unbanked use it this way. There appears to be a positive association between M-PESA adoption, bank use and savings and employment (Mbiti and Weil 2011:16).The service also impacts on other practices. It reduces informal savings (-38.3%, p<0.05), the practice of hiding money for saving (-77.2%, p<0.01), but, interestingly, it also translates to a positive increase in formal saving (+27.3%, p<0.01). In Mozambique, Batista and Vicente (2013) reported a positive, but insignificant, increase in general savings, but also a positive and significant increase in Mkesh savings (+24.9%, p<0.01). Demombynes and Thegaya (2012) found a positive increase in the amount of monthly saving (OLS: +11.8%, p<0.05| | IV:+31%) and the likelihood of saving (+19%, p<0.01)

In addition, a more recent study by Blumenstock et al. (2015) discussed that employees who received their salaries on M-Paisa, the Afghan telecom operator's mobile money platform, were more likely to use M-Paisa's platform as a place to retain their savings, as an alternative to informal saving. The study found no evidence to support the claim that the use of M-Paisa has an effect on users' overall saving behaviours.

The meta-analysis results of the three studies are depicted in figure 9. The combined analysis of shows that m-money as an intervention leads to greater savings, although the improvement is not statistically significant, at a level of 5% (pooled RR: 1.17; 95% CI: 0.99-1.38).

Figure 9: Response ratio impact of mobile money on saving



Consumption

There were four studies that looked at the impact of remittance through mobile-phone networks in respect of use. Some of the underlying assumptions were that efficiency gains led to more funds that can be re-appropriated or used, and, moreover, the network created allows for a wider range of possible fund sources and smooths cash flows over time.

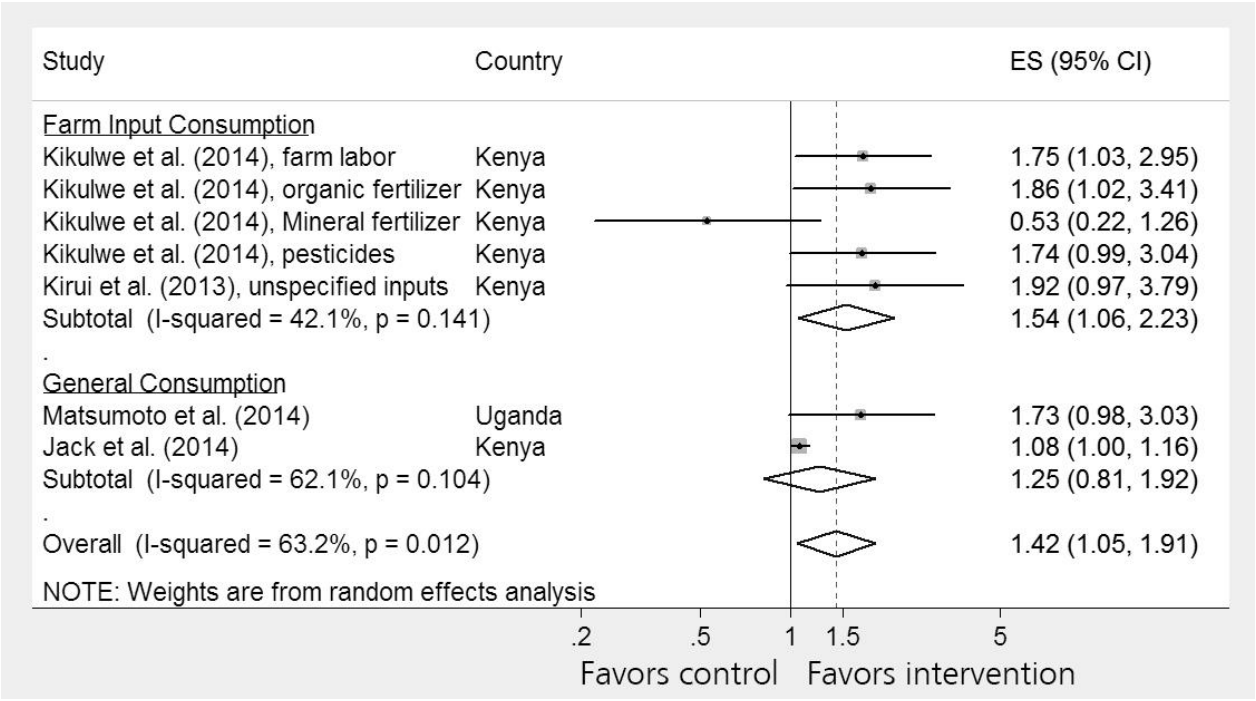
Increased consumption of goods

One example is the finding by Munyegera and Ggombo (2014), which noted that per capita consumption can increase with m-money use. In their study, it rose from US$29 to US$47 by 2012. This translates, by their calculations, to a 13% increase in per capita consumption for users of m-money services.

In Aker et al.'s case of m-Zap use in Niger, the authors reported a significant increase among m-financial service users in the types of food and non-food items they consumed (+20.1%, $p<0.01$). They also had a more diverse diet (+14%, $p<0.05$). There was a depletion of non-durable assets *(measured as non-durable assets owned)* (+20.3%, $p<0.01$). They had 0.78 more types of goods purchased, they were 20.2% more likely to purchase non-staple grains, and more likely to consume fats. But, they found no evidence as to whether the remittance would be spent within the community or outside.

However, no generalisations could be made on how the savings are used, since not all studies measure the same alternative uses for it.

Figure 10: Response ratio impact of mobile money on consumption



Jack and Suri (2014) documented the impact of m-money on the smoothing of consumption patterns, even in times of shock. In particular, they reported that per capita consumption fell for non-users when they experienced a negative income shock, as well as for those who did not have good access to the agent network (-7.37%,$p<0.1$), whereas no such drop-off was experienced by M-PESA user households in terms of consumption. Furthermore, users who suffered an illness shock had a higher rate of consumption (+7.81%, $p<0.1$). Other findings reported include a decrease in non-health consumption in case of an illness shock for non-users (-8.68%,$p<0.1$), and higher consumption among poor users in case of a general shock (+12.7%,$p<0.01$)

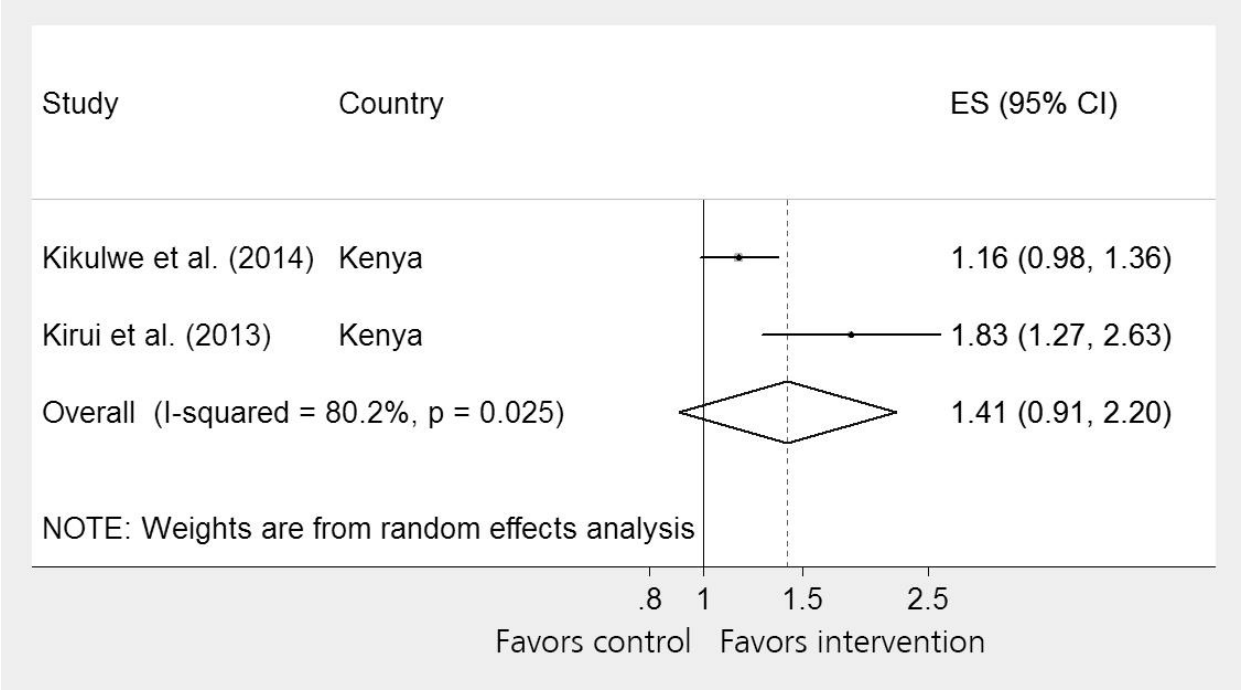
In terms of using the remittances received for agricultural inputs, two studies (Kikulwe et al. 2014 and Kirui et al. 2013) looked into this. Kirui et al. (2013) reported a significantly higher amount used for agricultural inputs among M-PESA user households (Ksh.3,079, or $42, more than non-users ($p<0.05$)). Kikulwe et al. (2014), however, reported significantly higher spending for hired labour, organic fertilizer and pesticide use. There was also higher spending for non-mineral fertilizer, but this was not significant.

Figure 10 shows the meta-analysis forest plot of all studies on consumption. The results of the two studies (Kikulwe et al. 2014, Kirui et al. 2013) that looked at consumption of farm inputs, the results show that m-money is responsible for an increase in farm-inputs consumption on user households compared to non-user households, and the results are significant, at 5% (pooled RR:1.54; 95% CI:1.06 - 2.23). However, overall, the impact on general consumption is positive, albeit not significant, at 5% (pooled RR: 1.25; 95% CI: 0.81 - 1.92). Combining the effects of all kinds of consumption, specified for farm input and those for general consumption, meta-analysis results show that m-financial services cause an increase of 42% percent to user households, compared to non-user households, which is statistically significant at the 5% level (pooled RR: 1.42; 95% CI: 1.05 - 1.91).

C. IMPACT ON LIVELIHOODS AND INCOME

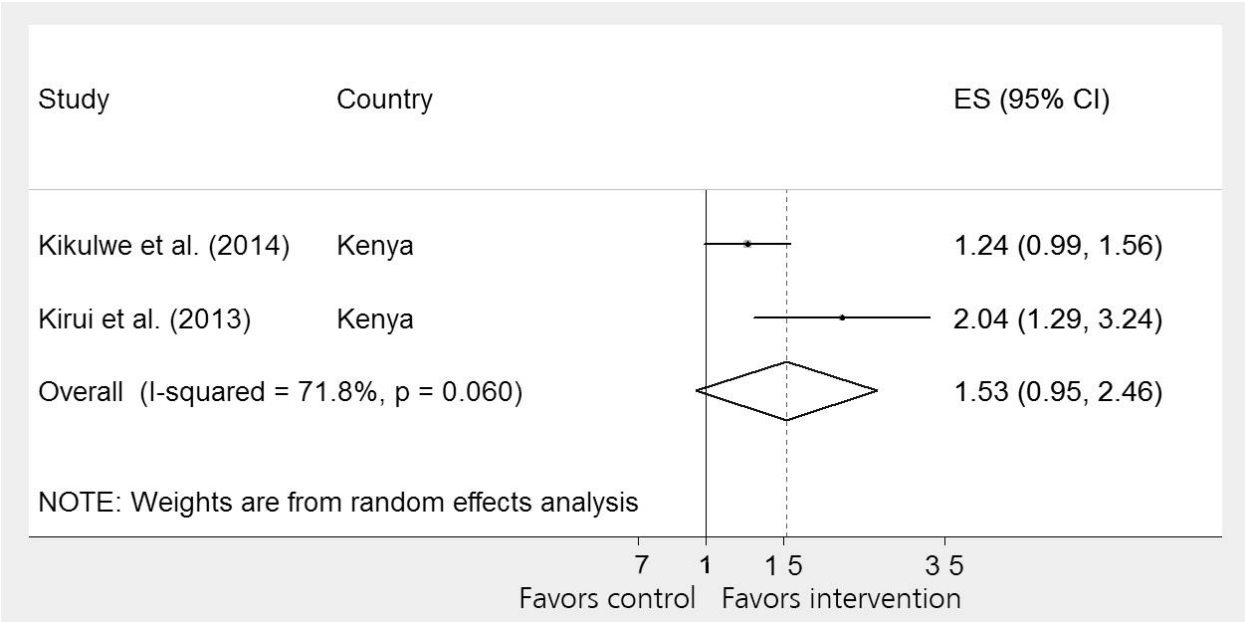
The two papers that looked at consumption of farm inputs (Kikulwe et al. (2014) and Kirui et.al. 2013) examined how this translated to higher farm yields, commercialization and, eventually, higher income (Kirui et al. 2013, and Kikulwe et al. 2014).

Figure 11: Response ratio impact of mobile money on % of farm yield sold



According to Kirui et al. (2012), the higher use of inputs (by US$42) for m-money-user households, has led to significant differences in terms of commercialization, which was 37% higher ($p<0.05$), and a significant increase in household income by US$224 ($p<0.01$). Kikulwe et al. (2014) also saw increases in overall income, and increases in farm income in terms of proportions of outputs and profits, although the difference was not significant ($p < 0.1$).

Figure 12: Response ratio impact of mobile money on income



The results from the meta-analysis show that m-money services cause an increase in the percentage of farm yield sold (pooled RR: 1.41; 95% CI: 0.91 – 2.20), as well as an increase in household income (pooled RR: 1.53; 95% CI: 0.95 – 2.46) as seen in figure 11 and figure 12 respectively. However, these effects are not statistically significant. Since the results are not conclusive, it leaves the door open for further research in the area.

4.2 Summary of results of synthesis

The systematic review has shown how several studies in Africa have demonstrated significantly higher volumes of remittances received among m-financial service users, compared to non-users. M-money as an intervention also leads to greater savings, although the overall difference is not statistically significant. In cases where it has been used for cash transfers in farm inputs, m-money has been found to be significantly responsible for a 54% increase in farm-input consumption, compared to non-users. In turn, this has also contributed to an increase in household income and farm yield sold.

5. Implications

Outline of chapter

This chapter briefly recapitulates the key findings from the systematic review, while also discussing some of the noteworthy studies that were not included. It then proceeds to discuss the implications of the systematic review findings, in respect of policy, government programmes and m-money research in general, and the strengths and limitations of systematic reviews.

5.1 Summary of key findings

As reported in the previous chapter, evidence from the ten papers that made up this SR suggest that mobile-finance services are making an impact in terms of increasing the volume and frequency of remittances received by users. In cases where they have been used for cash-transfer programmes in agriculture, they were found to improve farm-input consumption among users compared to non-users, which also led to increased farm yield sold and increased income among these adopters. They were also found to contribute only an insignificant increase in savings.

It should be mentioned that, aside from the final ten papers that were integrated, there were other noteworthy studies that were retrieved during the course of the systematic review, which provide evidence of the various models of m-money adoption and roll-out in other countries, as well as efforts to provide more empirical evidence of its use. For instance, there is an unpublished Master's thesis by Frederick (2014) that looked at the impact of money usage on micro-enterprise profits in Zambia. It was not included, however, because micro-enterprise use as a unit of analysis was not a focus of this systematic review.

Two other papers (Renteria 2015, Blumenstock et al. 2015), were published after the period papers were retrieved, screened and critically assessed. They are noteworthy because they studied m-money use in non-African settings. There were also some risk-of-bias issues concerning their design. For instance, Blumenstock et al. (2015) looked at an m-money salary-payment programme that was being implemented in Afghanistan. However, there were concerns about the sample, as it dealt largely with employees, and most of the benefits that were documented were benefits for the organization in terms of efficiency and costs. All in all, the sampling excluded the receiving end of the population, and it did not have any significant impact that could be included in the meta-analysis. Renteria's (2015) quasi-experimental study, in contrast, looked at a mobile-banking pilot project in Mexico. His investigation saw no change in homecare, education, or fuel and energy consumption, even with an m-money intervention. Unfortunately, the design was not able to control for the impact of the mobile phone as distinct from the impact of mobile money itself, in contrast with what Aker et al. (2011) were able to do in their experiment.

5.2 Implications

5.2.1 Policy

In terms of cash transfers in general, the emerging evidence is promising. In places such as Kenya, where the m-money ecosystem is well developed, there is evidence that the frequency and volume of remittances is higher for m-money users. Also, given that one desired objective of using m-money is to get financial services to the unbanked, evidence suggests that it leads to more savings, although the significance of the difference has varied across studies, and is not believed to be significant overall.

There is also some encouraging evidence in respect of how these transfers are used. The increase in volume and frequency has led to a smoothing of cash flows and more stable consumption patterns, especially in times of calamity (e.g. drought, earthquakes and other natural disasters). This suggests that it is important to strengthen the m-money ecosystem in a country, to help stabilize the access of people to needed credit through government outreach programmes (where applicable), as this can help in increasing its developmental impact.

5.2.2 Practice

Several papers that were unearthed through this systematic research examine the use of m-money for delivering very specific interventions. Among these are conditional cash-transfer programmes (e.g. Aker et al. 2011), payment facilities and salary payment. This is attributable to efficiency gains that often accrue to the implementing agencies or organizations. Some caution is advised, however, when designing such programmes, in order to ensure that the burden of costs is not transferred to the individuals accessing the transfers (see Blumenstock et al. 2015). Nonetheless, where conditional cash-transfer programmes have been used, there have been positive results in terms of diversity of diet, as well as in terms of investments in agricultural inputs, depending on the conditionalities. In cases where additional remittances are invested in livelihoods, then there is a commensurate increase in productivity and income. This suggests that a good integration of m-money services into existing government outreach programmes (where applicable) can be helpful in increasing developmental impact.

5.2.3 Research

Given that all the papers that appear in this systematic research were published after 2011, it is apparent that the call for more empirical evidence on the impact of m-financial services (Duncombe and Boateng 2009) has been heeded. However, judging by the small number shown here, much is yet to be done. Some of the results are positive, but remain inconclusive, and, as such, further research into the matter is needed. There are also clear gaps in terms of locations where the studies have been conducted. Most have been conducted in Africa, in particular in Kenya, whereas research in Latin America and Asia is still not represented. This is problematic, considering how widespread m-financial services now are.

In addition, there are some qualitative aspects that were documented, touching on power and gender relations (for example, Aker et al. 2011), especially in respect of how decision-making is conducted regarding m-money, but were not measured quantitatively.

This points to some of the limits of this systematic research, since many qualitative impacts also mentioned in much of the m-financial-services literature has not been operationalized quantitatively.

It is to be hoped that, from this short list of empirical evidence, some lessons can be adopted on which future impact assessments can be based. Particularly promising areas of research are development initiatives that incorporate the use of m-money into their design. Notable here are initiatives on conditional cash transfers and payments. Often, the conditions are related to education, health and agriculture. In such cases, the introduction of experimental and quasi-experimental designs that also look at identifiable developmental objectives (e.g. health, education, livelihoods) are possible, and perhaps even replicable, given the growing popularity of conditional cash transfers in the developing world.

One common limitation of performing quantitative systematic research in development studies is how different outcome and impact indicators are operationalized. This is because programmes may have different designs, and goals tend to be diverse and operationalized in different ways. However, the prospects for aggregating results in m-financial services, as shown in this systematic research, are very promising. This is because there are some common applications (e.g. cash transfers, payment systems), with some common outcomes that can be measured (frequency, volume of transfers). It is how they are used or consumed (e.g. for food, for livelihood inputs), and other downstream impacts that tend to be more challenging.

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Appendices

Appendix 1.1: Authorship of this review

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Conflicts of interest

Lead author has published related work on mobile financial services.

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Appendix 2.1: Countries included in the study

Countries as classified by The World Bank as low and lower-middle income.

(source: http://data.worldbank.org/about/country-and-lending-groups#Low_income (accessed 21 November 2015)

Low-income economies ($1,045 or less)

Afghanistan	Gambia, The	Niger
Benin	Guinea	Rwanda
Burkina Faso	Guinea-Bissau	Sierra Leone
Burundi	Haiti	Somalia
Cambodia	Korea, Dem Rep.	**South Sudan**
Central African Republic	Liberia	Tanzania
Chad	Madagascar	Togo
Comoros	Malawi	Uganda
Congo, Dem. Rep	Mali	Zimbabwe
Eritrea	Mozambique	
Ethiopia	Nepal	

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Lower-middle income economies ($1,046 to $4,125)

Armenia	Indonesia	Samoa
Bangladesh	**Kenya**	São Tomé and Principe
Bhutan	Kiribati	Senegal
Bolivia	Kosovo	Solomon Islands
Cabo Verde	Kyrgyz Republic	Sri Lanka
Cameroon	Lao PDR	Sudan
Congo, Rep.	Lesotho	Swaziland

Côte d'Ivoire	Mauritania	Syrian Arab Republic
Djibouti	Micronesia, Fed. Sts.	**Tajikistan**
Egypt, Arab Rep.	Moldova	Timor-Leste
El Salvador	Morocco	Ukraine
Georgia	**Myanmar**	Uzbekistan
Ghana	Nicaragua	Vanuatu
Guatemala	Nigeria	Vietnam
Guyana	Pakistan	West Bank and Gaza
Honduras	Papua New Guinea	Yemen, Rep.
India	Philippines	Zambia

Note that some countries were re-classified in 2015. The following are notable for this study:

Economy	Old income group	New income group
Bangladesh	Low	Lower middle
Kenya	Low	Lower middle
Myanmar	Low	Lower middle
Tajikistan	Low	Lower middle
Mongolia	Lower middle	Upper middle
Paraguay	Lower middle	Upper middle
South Sudan	Lower middle	Low

In 2014, therefore, Mongolia and Paraguay would have met the inclusion criteria.

Appendix 2.2: Search strategy for electronic databases

The following were the key terms related to mobile money and mobile financial services that were searched for in electronic databases: (m-bank* or mbank* or "m bank*" or e-bank* or ebank* or "e bank*" or m-money or mmoney or "m money" or e-money or emoney or "e money" or e-payment* or epayment* or "e payment*" or m-payment* or mpayment* or "m payment*" or m-transfer* or mtransfer* or "m transfer*" or m-financial or mfinancial or "m financial" or m-transaction* or mtransaction* or " m transaction*" or m-pesa or mpesa or "m pesa" or GCash or "smart money" or WIZZIT).ti,ab.

The search was undertaken in combination with the following search considerations:

1. (Africa or Asia or Caribbean or West Indies or South America or Latin America or Central America).hw,ti,ab,cp.

2. (Afghanistan or Albania or Algeria or Angola or Argentina or Armenia or Armenian or Aruba or Azerbaijan or Bangladesh or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brazil or Bulgaria or Burkina Faso or Burkina Fasso or Upper Volta or Burundi or Urundi or Cambodia or Khmer Republic or Kampuchea or Cameroon or Cameroons or Cameron or Camerons or Central African Republic or Chad or China or Colombia or Comoros or Comoro Islands or Comores or Mayotte or Congo or Zaire or Costa Rica or Cote d'Ivoire or Ivory Coast or Cuba or Djibouti or French Somaliland or Dominica or Dominican Republic or East Timor or East Timur or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Ethiopia or Fiji or Gabon or Gabonese Republic or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Grenada or Guatemala or Guinea or Guiana or Guyana or Haiti or Honduras or Hungary or India or Maldives or Indonesia or Iran or Iraq or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or Kirghiz or Kirgizstan or Lao PDR or Laos or Lebanon or Lesotho or Basutoland or Liberia or Libya or Macedonia or Madagascar or Malagasy Republic or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Mali or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Middle East or Moldova or Moldovia or Moldovian or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Netherlands Antilles or New Caledonia or Nicaragua or Niger or Nigeria or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Puerto Rico or Romania or Rumania or Roumania or Rwanda or Ruanda or Saint Lucia or St Lucia or Saint Vincent or St Vincent or Grenadines or Samoa or Samoan Islands or Navigator Island or Navigator Islands or Sao Tome or Senegal or Serbia or Montenegro or Seychelles or Sierra Leone or Slovenia or Sri Lanka or Solomon Islands or Somalia or Sudan or Suriname or Surinam or Swaziland or Syria or Tajikistan or Tadzhikistan or Tadjikistan or Tadzhik or Tanzania or Thailand or Togo or Togolese Republic or Tonga or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uzbekistan or Uzbek or Vanuatu or New Hebrides or Venezuela or Vietnam or Viet Nam or West Bank or Yemen or Yugoslavia or Zambia or Zimbabwe).hw,ti,ab,cp.

3. ((developing or less* developed or under developed or underdeveloped or middle income or low* income or underserved or under served or deprived or poor*) adj (countr* or nation? or population? or world)).ti,ab.

4. ((developing or less* developed or under developed or underdeveloped or middle income or low* income) adj (economy or economies)).ti,ab.

5. (low* adj (gdp or gnp or gross domestic or gross national)).ti,ab.

6. (low adj3 middle adj3 countr*).ti,ab.

7. (lmic or lmics or third world or lami countr*).ti,ab.

8. transitional countr*.ti,ab.

9. exp developing countries/

10. or/1-9

An information scientist, John Eyer, helped run the search in selected databases. The databases that were accessed through this method were the following (from 4 April until the end of May 2014), Econlit (Ovid), Business Source Premier from EBSCO, CAB Abstracts, Public Affairs Index, Web of Science (WoS search), ToC (Table of Content) Premier from IDRC, Proquest dissertation (UK and US), Scopus. However, we were unable to gain access or do an electronic search of the communication and mass media database.

Appendix 2.3: Exclusion criteria

After the electronic search was conducted, the team used the following exclusion criteria on the titles (first screening) and abstracts (second screening):

EXCLUSIONS:

1. Exclude publication before 2000
2. Exclude high-income and middle income (not in Annex 10)
3. Exclude not using mobile phones
4. Exclude paper not on mobile money
5. Exclude not on impact
6. Exclude theoretical only
7. Exclude if qualitative only
8. Exclude feasibility/potential only

Appendix 2.4: Data-extraction tool

The data-extraction tool was created on an Excel template within the following parameters:

I. BACKGROUND DETAILS OF THE PAPER

Paper title

Author

Date of publication

Author affiliation funder

Type of publication

Conflict of interest with reviewer

Description of conflict, if any

Any additional coder comments

II. INTERVENTION DETAILS

Type of intervention

Intervention agency

Intervention objectives

Intervention description

Intervention duration

Control description

Control duration

III. STUDY DESIGN DETAILS

Study population

Sample/observations

Representativeness

Type of data (e.g. survey)

Frequency and period of data collection

Method of data collection

Independent variable (e.g. urban-rural, income, gender)

Dependent variable

Treatment variable

Method of analysis

Effect size

Gender disaggregation (if any)

Age

Age SD

Education

Occupation

Baseline conditions

Policy history

Community characteristics

Significant event, if any (e.g. drought, earthquake)

IV. OUTCOMES AND IMPACT

Take-up of mobile money service measured (e.g. M-PESA, M-ZAP)

Quality of service measured

Quality of service result

Individual income (baseline and result)

Household income (baseline and result)

Individual remittance transfers (frequency, volume) (baseline and result)

Household remittance transfers (frequency, volume) (baseline and result)

Number of transfers per month measured (individual)

Number of transfers per month result (individual)

Number of transfers per month measured (household)

Number of transfers per month result (household)

Business profit/outcomes measured (measure and result)

Consumption expenditure patterns measured

Consumption expenditure patterns (result)

Efficiency gains/transaction costs (measured)

Efficiency gains/transaction costs (result)

Security measured

Security result

Financial inclusion measure

Financial inclusion result

Economic growth measured

Economic growth result

Power relations measured

Power relations result

Baseline T

Baseline SD T

Baseline C

Baseline SD C

Endline T

Endline SD T

Endline C

Endline SD C

Number of clusters

Units of analysis

Sustainability of the intervention

Cost of the intervention

Qualitative components

Details of qualitative component

V. RISK OF BIAS

Group equivalence

Hawthorne and John Henry effects

Spillover effects

File drawer effects

Selective methods of analysis

Other sources of bias

Statistical significance

Additional comments

VI. ADDITIONAL DATA EXTRACTED

Sublocation remittance transfers measured (frequency)

Sublocation remittance transfers result (frequency)

Sublocation remittance transfers (likelihood)

Sublocation employment

Sublocation non-farm employment

Appendix 2.5: Assessment of risk of bias

Quality assessment for included studies was implemented following the Waddington and Hombrados (2012) tool. This tool is designed to evaluate quality of experimental and quasi-experimental studies against underlying statistical and theoretical assumptions. The tool is described in the table below:

	Evaluation criteria	Category of bias	Relevant questions
1.	Mechanism of assignment	Selection bias	• For experimental designs: is the allocation mechanism appropriate to generate equivalent groups?
2.	Group equivalence in implementing	Confounding	• Is the method of analysis adequately executed? • Are the observable results of the counterfactual identification process convincing? • Are all likely relevant confounders taken into account in the analysis? Is the estimation method sensitive to non-random analysis?
3.	Hawthorne effects	Motivation bias	• Are differences in outcomes across groups influenced by participant motivation because of programme implementation and/or monitoring?
4.	Spill-over and cross-over	Performance bias	• Is the programme influencing the outcome of the individuals in the control group (including compensating investments for control groups)?
5.	Selective method of analysis	Analysis reporting bias	• Is the method of analysis of specification model used by the author selectively chosen? • Is the analysis convincingly reported (and available for replication)?
6.	Other sources of biases	Other biases	• Are the results of the study subject to other threats to validity (e.g. placebo effects, courtesy bias, survey effects, inadequate survey instrument, etc.)
7.	Confidence intervals and significance of the effect	Type I and Type II error	• Is the study subject to a unit of analysis error not adequately accounted for?

- Is the study subject to heteroscedasticity not accounted for?
- Is the study not considering possible heterogeneity in effects?
- Is the lack of significant effects driven by the lack of power?

Adapted from Waddington and Hombrados (2012)

At least two reviewers independently assessed the quality of each study across every criterion, allocating 1, 2 or 3 for high, medium and low quality, respectively; then, the average score was determined. Subsequently, the results from both reviewers were compared and, wherever there was a discrepancy, differences were discussed and resolved. Studies that scored high and medium quality were included in the meta-analysis, while those that scored low quality were discussed, but not included.

Assessment of risk of bias in the included studies

Author	Paper title	Group equivalence	Hawthorne & John Henry effects	Spillover effects	File drawer effects	Selective methods of analysis	Other sources of bias
Jack W, Ray A, Suri T	Transaction networks: evidence from mobile money in Kenya	low risk	low risk	neutral	low risk	low risk	low risk
Mbiti I, Weil D	Mobile banking: the impact of M-Pesa in Kenya	low risk	low risk	neutral	low risk	low risk	low risk
Jack W, Suri T	Risk sharing and transaction costs: evidence from Kenya's mobile money revolution	low risk	low risk	neutral	low risk	low risk	low risk
Blumenstock, J. Eagle, N. and Fafchamps, M.	Risk and reciprocity over the mobile phone network: evidence from Rwanda	low risk	low risk	low risk	low risk	low risk	low risk
Aker J, Boumnijel R, McClelland A, Tierney N	Zap it to me: the short-term impacts of a mobile cash transfer programme	low risk	low risk	low risk	low risk	low risk	low risk
Batista C, Vicente P	Introducing mobile money in rural Mozambique: evidence from a field experiment	low risk	low risk	accounted in the study design	low risk	low risk	low risk
Kirui O, Okello J, Nyikal R, Nyiraini G	Impact of mobile phone-based money transfer services in agriculture: evidence from Kenya	low risk	low risk	low risk	low risk	low risk	low risk
Munyegera G, Matsumoto T	Mobile money, remittances and rural household welfare: panel evidence from Uganda	low risk	low risk	neutral	low risk	low risk	low risk
Kikulwe E, Fischer E, Qaim M	Mobile money, smallholder farmers, and household welfare in Kenya	low risk	low risk	neutral	low risk	low risk	low risk
Demombynes G, Thegeya, A	Kenya's mobile revolution and the promise of mobile savings	low risk	low risk	low risk	low risk	low risk	low risk

Appendix 4.1: Details of studies included in the systematic review

Author(s), Year	Country	Design, Methodology	Population	Intervention	Comparator	Outcomes (direction, raw effects of the intervention on the treatment group, statistical significance) *Note: NS - not significant*
Jack W, Ray A, Suri T 2013	Kenya	2 period panel; OLS	Representative 2018 households sampled across Kenya	Adoption of mobile-money service	N/A	● Regular support remittance **(+24.2%, p<0.01)** ● Credit remittance (informal loans) **(+15.1%, p<0.01** ● Emergency remittance **(+13.2%, p<0.01)**
Mbiti I and Weil D 2011	Kenya	2-period panel; DiD	Representative 190 sub-locations sampled across Kenya	Adoption of mobile service	N/A	● Saving ✓ Informal saving **(-38.3%, p<0.05)** ✓ Hide money for saving **(-77.2%, p<0.01)** ✓ Formal saving **(+27.3%, p<0.01)** ● Loans ✓ Formal **(+0.3%, NS)** ✓ Informal **(+4.6%, NS)** ● Employment ✓General employment **(+30.8%, p<0.01)** ✓Employed in non-farm jobs **(+9.4%, NS)** ● Banking **(+27.9%, p<0.01)**
Jack W, Suri T 2014	Kenya	2-period panel; DiD	Representative 2,282 households sampled across Kenya	Adoption of mobile service	N/A	● Consumption ✓ For non-user, in case of a general shock **(-7.37%, p<0.1)** ✓ For users, in case of an illness shock **(+7.81%, p<0.1)** ✓ Non-health consumption in case of an illness shock, for non-userS **(-8.68%, p<0.1)** ✓ For the poor in case of a general shock, for users **(+12.7%, p<0.01)**

Author(s), Year	Country	Design, Methodology	Population	Intervention	Comparator	Outcomes (direction, raw effects of the intervention on the treatment group, statistical significance) *Note: NS - not significant*
Aker J, Boumnijel R, McClelland A, Tierney N 2011	Niger	RCT; simple difference	96 villages from Tahoua region in Niger; a relatively poor community, stricken with drought and hunger	Using mobile-money service (ZAP) to receive cash transfer. N = 32 villages	Placebo group (32 villages that used ZAP capable mobile phones, but received their cash transfer as cash), and a pure control group (32 villages that were not supplied with phones, and continued to receive their cash transfer in cash)	• Types of food and non-good items consumed **(+20.1%, p<0.01)** • Diet diversity **(+14%, p<0.05)** • Depletion of non-durable assets *(measured as non-durable assets owned)* **(+20.3%, p<0.01)** • Diversity in the basket of crops production **(+8.1%, p<0.1)** Note: 1. *The results have been changed to percentage change* 2. *ZAP group over placebo results have been reported, since they decouple effects of mobile phone service on the intervention*
Batista C, Vicente P 2013	Mozambique	RCT; OLS	102 rural enumerations areas in the provinces of Maputo, Gaza and Inhambane, Mozambique	Educating the treatment group (51 EA, that is 1,020 individualS) about mobile-money services, and provide the targeted individuals (4 individuals in each EA, making a total of 204) in the treatment group with a mobile-money account and initial deposits	51 EAs, 20 people randomly selected from each EA, making 1,020 individuals who did not receive the treatment	• Saving ✓ General saving **(+4.3%, NS)** ✓ Mkesh saving **(+24.9%, p<0.01)**

Author(s), Year	Country	Design, Methodology	Population	Intervention	Comparator	Outcomes (direction, raw effects of the intervention on the treatment group, statistical significance) *Note: NS - not significant*
Kirui O, Okello J, Nyikal R, Nyiraini G 2013	Kenya	Cross-sectional; PSM	379 farming households randomly sampled from Kirinyaga district (Central province), Bungoma district (Western province), and Migori district (Nyanza province)	Adoption of mobile-money service, N = 198 households	A group of 181 families that have not adopted mobile-money serviceS	• Income **(+Ksh.17,757, p<0.01)** • Input use (consumption) **(+Ksh.3079, p<0.1)** • Commercialization (financial inclusion) **(+37%, p<0.05)**
Munyegera G, Matsumoto T 2014	Uganda	2-period panel; DiD	838 households sampled across Uganda	Adoption of mobile-money service, N= 325 households	Families that have not adopted mobile-money services. N = 521	• Consumption **(+72.7%, p<0.1)**
Kikulwe E, Fischer E and Qaim M 2014	Kenya	2-period panel; fixed effect regression	320 households sampled from Central and Eastern provinces in Kenya	Adoption of mobile-money service.	N/A	• Income **(+KSh.61,470, p<0.1)** • Farm inputs use (cash used for) ✓ Hired labour **(+KSh. 4,122, p<0.05)** ✓ Organic fertilizer **(+KSh.2,502, p<0.05)** ✓ Mineral fertilizer **(-KSh.1,640, NS)** ✓ Pesticides **(+KSh. 1,212, p<0.1)** • Farm income ✓ Proportional of output sold **(+10.4%p<0.1)** ✓ Profits **(+KSh. 30,112, p<0.1)** *note: all values per acre

Author(s), Year	Country	Design, Methodology	Population	Intervention	Comparator	Outcomes (direction, raw effects of the intervention on the treatment group, statistical significance) *Note: NS – not significant*
Demombynes G, Thegeya A 2012	Kenya	Cross-section; OLS, Probit and IV	5,087 individuals sampled across Kenya; however, for the main dependent variable regression, 2,265 individuals	Adoption of mobile-money service (particular-ly M-PESA)	N/A	• Saving ✓ Amount of monthly saving **(OLS: +11.8%, p<0.05 | | IV: +31%, NS)** ✓ Likelihood of saving **(+19%, p<0.01)**

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