‘Leapfrogging’: a Survey of the Nature and Economic Implications of Mobile Money

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“Leapfrog: to improve a position by going past others quickly or by missing some stages of an activity or process.” [Cambridge Business English Dictionary, CUP]

1. Introduction

Mobile money is novel: it was barely heard of a decade ago. The first service for the unbanked became active in 2001, but it is probably the phenomenal growth since 2007 of Kenya’s M-Pesa system that has brought mobile money to international prominence.² Mobile money refers to financial transaction services potentially available to anyone owning a mobile phone, including the underbanked and unbanked global poor who are not a profitable target for commercial banks. An individual installs a mobile phone application and sets up an electronic money account with the mobile money services provider (after providing identity documents), and deposits cash in exchange for electronic money. The electronic money can be stored or withdrawn as cash, or transferred via a coded secure text message to others domestically, without the customer having a formal bank account.

The best known fact about mobile money is its rapid spread in the developing world, “leapfrogging” the provision of formal banking services. The leapfrogging occurs because new technologies solve problems arising from weak institutional infrastructure and the cost structure of conventional banking. Beck and Cull (2013) argue that small size, volatility, informality and poor governance provide constraints on the commercial viability of financial institutions in Africa. The cost of maintaining sufficient physical bank branches in rural unbanked locations is prohibitively high, and the poor mostly cannot afford the minimum balance requirements and regular charges of most bank accounts. Mobile phone technology has the advantage that consumers themselves invest in the mobile phone handset, while the (scalable) infrastructure is already in place for the widespread distribution of airtime through secure network channels. A stark illustration is to contrast global numbers of mobile phone and landline subscriptions, and note the low density of banking infrastructure in the developing world (Figures 1 and 2).³ Thus, mobile money has filled a lacuna and bypassed the binding constraints on the provision of traditional banking infrastructure in developing countries. As Veniard (2010) has aptly expressed it, mobile money has “changed the economics of small accounts”.

The poor are especially vulnerable to risk (e.g. from illness, unemployment, death of family members, or natural disasters). Enhancing financial inclusion of the unbanked urban and rural poor, now a goal of the G20 (see Section 4), can diversify risk. But for decades, policy has centred on inclusion by extending access to formal financial infrastructure. Progress has been stymied by the economics of formal sector banking⁴. Mobile money has the practical potential to enhance financial inclusion. The adoption of mobile money is a first step, giving under-served citizens convenient access to secure means of transfer and payments at a lower cost, and making it possible to save with privacy. Registered users of mobile money then have a pathway to formal sector financial services that are accessed just with a mobile phone: to interest-bearing savings accounts that can protect assets;

² A detailed anatomy of M-Pesa (“M” for mobile, “Pesa” for “money” in Swahili) is given in Box 1.
³ Before the advent of mobile money in Kenya, there were fewer than three bank branches per 100,000 people (IMF, FAS, Appendix, Table A1). Saving was mostly as cash under the mattress. Domestic transfers used scarce post office branches, or insecure intermediaries such as friends or bus-drivers. International remittances were received expensively via money transfer companies (e.g. Western Union) into bank accounts, or through Hawala (Sections 3.6 and 5.4).
⁴ The micro-credit movement in the informal sector addresses the asymmetric information problem and allows small accumulated sums by groups to help individual members spread risk. However, assessing micro-finance in a long-running evaluation in India, Banerjee et al. (2014) conclude that it has not been that successful.

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Credit extension to invest in livelihoods; and insurance products\(^5\) to reduce risk. The key is the movement of cash into electronic accounts, and a record, for the first time for the unbanked, of the history of their mobile money transactions in real time. Using algorithms\(^6\), these records provide evolving individual credit scores/ratings for the unbanked. This technological innovation helps overcome the perennial asymmetric information constraint faced by conventional banks in lending to the collateral-less poor. A successful example of this is Kenya’s M-Shwari product (meaning “calm” or “cool”, Box 1). Moreover, the fast spreading advent of cheaper smartphones potentially offers easier access to financial services for huge numbers of illiterate people through well-designed (educative) applications. Though initially dominated by person-to-person (P2P) domestic transfers, mobile money systems have expanded into a broader payments platform for utility bills, rent, taxes, school fees and retailers. Business usage is expanding rapidly through special networks for the payment of suppliers and wages. Government usage for the payment of wages and social security has lagged, though the cost gains, especially in insecure environments, are potentially great (Section 8.1.4).

Attention has focused on the spread of mobile money in Africa; but it is a \textit{global} phenomenon. By January, 2015, there were 256 mobile money services for the unbanked in 89 countries\(^7\) with more than 40 million users; in June, 2013, there were 326 million transfer transactions valued at US$3.2 billion in aggregate (Pénicaud and Katakam, 2014). Though slow to take off, rapid growth areas are now in Asia and Latin America. The success in Africa, notably the M-Pesa system of Safaricom, a subsidiary of Vodafone, has recently been exported by Vodafone to Europe (Romania\(^8\) in 2014) and to India (in 2013). Mobile money payments have been slower to take hold in advanced countries, but are predicted to grow rapidly in the near future. Indeed, Facebook, Apple, Google and banks are actively attempting to partner with companies to offer payments services.\(^9\)

Mobile money is thus “big business”, but ironically, it is not easily profitable. By 2011, only one scheme (M-Pesa) had achieved operational profitability. The mobile money provider is usually a mobile network operator (MNO) acting alone or in formal partnership with one or more banks. They exploit the wide-spread ownership of mobile handsets, and invest in improving network coverage and the evolution to third-generation (3G) and fourth-generation (4G) systems. Crucial to achieving “scale” is a heavy investment in (often exclusive) agent networks with training and monitoring, and is one of the largest start-up and operational costs for entrepreneurial providers. Outsourcing to third parties incurs considerable cost savings in providing branchless banking and has vast potential for expanding the geographical reach of services.\(^10\) The challenge for national regulation is to facilitate innovation, but also to promote competition and the protection of customers with increasingly sophisticated products. In due course, account-to-account interoperability will need to be implemented to achieve the full potential for digital transactions.

Given its relatively recent innovation, there is a paucity of literature relating specifically to mobile money and its economic impact. A body of literature analyses the economic impact of mobile phones (e.g. Aker and Fafchamps (2013) on how cell phone coverage reduces the spatial dispersion of

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\(^5\) There are 123 mobile insurance, credit and savings services live of which 27 were launched in 2013 (Pénicaud and Katakam, 2014), see Section 3.5.

\(^6\) See Section 3.4 and the use of algorithms by the credit company, Experian, amongst others.

\(^7\) The Mobile Money for the Unbanked (MMU) Deployment tracker of the GSMA (Groupe Speciale Mobile Association), see Appendix Table A1.

\(^8\) In Romania, more than one third of the population do not have access to conventional banking, and seven million people mainly use cash rather than cards. Users will be able to transfer as little as one new Romanian leu or up to 30,000 leu (about £5,500 pounds) per day.

\(^9\) See for example, Financial Times 30\(^{th}\) January, 2015, p18

\(^10\) In addition to facilitating the deposit and withdrawal of cash (cash-in-cash-out), agents register, educate and motivate customers. Agent networks are discussed in Section 9, and see the Kenyan example in Box 1.
producer prices). There are surveys on the positive impact of access to financial services more broadly defined, possibly suggestive for mobile money (see Bauchet et al. (2011), updated and extended by Cull et al. (2014)).

This overview paper considers the channels of economic influence of mobile money from both a micro and a macro perspective, and it critically surveys the current state of micro and macro literature on the economic effects of mobile money. New access to terabytes of administrative data from multiple mobile phone and mobile money operators in many countries promises a data revolution, and possibly with it a research revolution. Quantitative records of household and business expenditure through mobile money payments, and the use of innovative tools to forecast hard-to-gauge household assets and expenditure could overcome measurement problems faced by household surveys (Section 7).

This survey is in four parts. First, the nature and functioning of mobile money is explained: the types of transactions, and the banking and insurance products it can lead to, along with its important role in widening financial inclusion and whether usage studies bear this out. Second, the market growth, profitability and other characteristics are charted and the likely future market developments and greater financial inclusion with cheaper smartphone technology are assessed. Third, the macro-economic and micro-economic effects of mobile money are examined, followed by a consideration of data measurement issues, and then a survey of selected empirical studies of the economic impact of mobile money. Fourth, regulatory and contractual issues are examined: the impact of design of network agency structures and agency contracts, and evolving regulation on the profitability and development of extended mobile money systems. The survey concludes with an acknowledgement of the impact of charities, donors and international agencies on the beneficial growth of mobile money, and suggestions for future research.

2. What is mobile money?

Mobile banking is defined in the US Federal Reserve’s annual survey of Consumers and Mobile Financial Services (Federal Reserve, 2014) as using a mobile phone (and hence mobile networks) to access (your) bank account, either by accessing the bank’s web page through the web browser on a mobile phone, via text messaging, or by using an “app” downloaded to the mobile phone. Essentially, mobile banking is a subset of electronic banking (or “e-banking”). E-banking itself is defined in Basel (1998) as ‘the provision of retail and small value banking products and services through electronic channels; these include 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.’

There is no standard regulatory definition of mobile money (or “m-money”) and electronic money (or “e-money”), Di Castri (2013) argues, though some jurisdictions define electronic money in regulation or legislation. Mobile money is a form of electronic money allowing the conduct of transactions through a mobile phone. The common characteristics of various definitions of mobile money are: it is electronic money issued on receipt of funds in an amount equal to the available monetary value; it is electronically recorded on a mobile device; the electronic value is redeemable for cash, and the electronic value may be accepted as a means of payment by parties other than the issuer (for example, payments of retail purchases, utility bills and school fees, payments of suppliers to businesses, for person-to-person transfers (P2P), for government-to-person (G2P) transfers or donor-to-person transfers, and for payment of services such as transport and parking, and taxes, fines and licence fees); and the electronic value is backed up by storage of equivalent funds in one or more banks depending on central banking or other regulations.
Slade et al. (2013) argue from a marketing perspective, that mobile-payments arose as “a solution to an unmet need rather than as a technology-led innovation”; they represent “a culmination of innovations, combining payment systems with mobile devices, to provide users with the ability to initiate, authorise and/or complete a financial transaction in which money or funds are transferred over mobile network or wireless communication technologies to the receiver through the use of a mobile device”.

A more circumscribed definition of mobile money, specifically to incorporate “banking the unbanked”, is used by the GSMA’s Mobile Money for the Unbanked Programme (MMU) to distinguish the phenomenon from e-banking products with formal financial institutions11. However, as mobile money systems evolve, and as smart-phones become ever cheaper in less advanced countries, the range of possible services could expand to link with products managed by formal financial institutions such as banks and insurance companies (see Section 3 and Box 1). This will ultimately blur the distinctions between mobile money and e-banking and e-insurance.

Mobile money can be issued by non-banks such as mobile phone operators, or by financial services institutions such as banks, or by a combination of the two, depending on the jurisdiction in the particular country. For example, in Kenya (see Box 1), the mobile phone operator, Safaricom, a subsidiary of Vodaphone, is licenced to issue mobile money without a formal partnership with a bank, though the net deposits from customers have to be invested in prudentially-regulated banks for safekeeping. By contrast, the new mobile money guidelines in Uganda (Bank of Uganda, 2013) stipulate a formal partnership between a prudentially regulated financial institution and an MNO.

Anyone with a mobile phone subscription, banked or unbanked, can open a mobile money account, provided that they are able to satisfy “know your client” procedures by the provision of the identity documents locally stipulated, download the relevant “app” onto their mobile phone, and pay the transactions costs for electronic transactions to the operator and its agents. In Kenya, mobile money users can deposit and store money in electronic form in mobile money accounts, can send that electronic value by codes in text messages to other mobile phone subscribers, and can withdraw physical cash from an agent of the operator thereby reducing the value of the electronic money account.

3. How does mobile money work and what financial innovations can it lead to?

Mobile money is characterised by considerable innovation – new products and types of transactions constantly evolve, some in cooperation with financial institutions, the business sector, governments and donors. With the wider availability of the smartphone, the possibilities will multiply, especially for access and education of the unbanked (see Section 5.5).

In more advanced countries, mobile money payments faces competition from entrenched financial products, such as payroll debit cards in the US (enabling employers to pay employees through payroll direct deposit even if they do not have bank accounts). Though the proportion of the under-banked and unbanked in the US is significant12, the uptake of mobile money for different payments and transfers has been limited, though the advent of the smart phone is predicted to change this (see Section 4.3). Commercial deals between Facebook, Google, Paypal and banks with

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11 “Services that offer the mobile phone as just another channel to access a traditional banking product are not included.” and “The service must be available even to customers with basic mobile devices” and “Customers must be able to use the service without having been previously banked.” (Pénicaud and Katakam, 2014, p4).

12 Under-banked is defined as having a bank account but using an alternative financial service such as a payroll card, payday lender, cheque cashier, or auto (car) title loan. The unbanked and under-banked US consumers comprise 11 percent and 17 percent shares, respectively, of all US consumers (US Federal Reserve’s annual survey of Mobile Financial Services (Federal Reserve, 2014)).
commercial payments partners are in prospect as the payments industry aims to exploit huge demand for the latest smartphones. First quarter earnings for fiscal year 2014/15 broke records for Apple, based on huge demand for the I-phone 6. Apple Inc. CEO, Tim Cook noted that since its launch in October 2014, Apple Pay has accounted for two out of every three dollars spent via contactless payments on Visa, Mastercard and American Express.\(^\text{13}\)

In poorer, cash-based countries, mobile money is predominantly used for private person-to-person (P2P) domestic transfers of money. Crucially, very small amounts can be transferred, even if this is more costly, see below. In such economies, mobile money strongly outclasses any competitors, such as transfer via scarce bank branches, expensive money transfer companies (e.g. Western Union) or highly risky use of bus-drivers or friends to deliver over long distances. Mobile money transfers are recorded, secure, instantaneous and relatively cheap\(^\text{14}\).

Payments innovation through more diverse channels using mobile money has made an appearance in many cash-based countries. Payments are possible for retail purchases (P2B), utility bills, rent, school fees, services such as public transport, parking and taxis, and taxes. Kenya has been a leader of the expansion of the business payments platform with an innovative network of businesses linked to customers through reduced transaction costs; Safaricom perceives this as the growth area of the future (see Box 1).

In countries with weak governance, beset by corruption and insecurity, mobile money payments from governments (G2P), business (B2P) and donors potentially offer a secure and less costly way of delivering wages and social transfers. However, there are only a few examples of these types of transfers to date. In Afghanistan, wages are paid securely through mobile payments by some private companies, and we survey empirical work on Afghanistan in Section 8.

Three nascent financial innovations, developed entirely from a mobile payments starting point, will enhance economic transparency and access to products from the banking and insurance sectors, beyond domestic money transfer and payments. These require the electronic mobile money accounts to be linked with bank accounts that are accessed only through the mobile money phone application. The three products are access to interest-bearing savings accounts and small loans, to micro-insurance products, and to secure and cheaper international remittances.

The “nuts and bolts” of basic mobile money domestic transfer payments are explained below. Then financial services innovations flowing from mobile money are discussed with several examples.

### 3.1 The “nuts and bolts”: deposits, withdrawals and domestic transfers

Mobile money systems rely on a network of agents linked under various contractual arrangements with a parent telecoms company, or a partnership between a prudentially-regulated bank and a telecoms company. The nature of these network structures and design of the individual contracts is also a matter of interest in the successful development of mobile money systems (see Section 9). Establishing an agency network and the training and monitoring of agents represents a considerable investment by operators to develop the market. In poorer countries such as Kenya, the network of transactional points lies outside bank branches making the service accessible to unbanked and underbanked people. The nature and evolution of mobile money systems are path-dependent; that is, existing institutions and cultural norms affect how the industry develops, and new institutions feed

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\(^{13}\) Apple conference call, 27 Jan. 2015: [http://events.apple.com/edgesuite.net/15iuhsdfvuoibwfvohub01/event/](http://events.apple.com/edgesuite.net/15iuhsdfvuoibwfvohub01/event/)

\(^{14}\) Morawczynski (2009) reports that the cost of sending 1,000 Kenya Shillings (US$15) from Nairobi to the western provinces via M-Pesa in 2008 was two-fifths of the post office rate and one-fifth of the cost of sending it via bus. Jack and Suri (2014) update this: to half the cost of sending through Western Union, about 30 percent of the cost via the postal bank, and a third of the bus delivery cost. Both exclude the sometimes substantial transport costs.
back into shaping norms. Case studies show, for instance, that different types of regulation have a considerable impact in the take-up and spread nationally of mobile money services (see Section 10).

What Villasenor (2013) calls “the bricks-and-mortar component of mobile money systems” are the shops, outlets or branches staffed by small business owners who are authorized agents15 of the mobile money services provider. In Kenya, the mobile money system, M-Pesa, distinguishes between wholesalers and retail agents. Retail cash merchants transact with their own cash and electronic money in their own M-Pesa accounts to meet customer demand. Wholesalers (banks or non-bank merchants) are allowed higher limits on electronic money stored in their M-Pesa accounts and perform a cash management service to allow retailers to maintain a liquid float (typically transacting daily with wholesalers, depositing cash or withdrawing cash depending on their net intake of cash). The cash-in/cash-out function in many cases has diversified from in-store cash merchants to street-based merchants.

Mobile phone users purchase a SIM card16 with the mobile money application for their phone, register with a retail agent (or what Klein and Mayer (2011) call a cash merchant) using their phone number and an identity document17 and acquire an electronic mobile money account which has then to be activated18. They deposit money into the electronic mobile money account by giving cash to the agent, and receive, in return, electronic money (or what Klein and Mayer (2011) call “book entry money”) via their mobile phone. To withdraw money, they transfer electronic money via their mobile phone to the agent’s electronic money account, and receive cash in return. Electronic money can be sent from a customer’s account to another account holder, and money can be sent to those who are not account holders. The latter transaction is more expensive, and the remitter’s own account is debited.

The user transfers money straightforwardly by accessing the service provider via an access code dialled from a mobile phone, enters the mobile phone number of the recipient and the amount to transfer, and authorises via a PIN code. A secure text message (SMS) with a code is sent in real time to the recipient, authorising a retail agent to transfer money from the remitter’s account into cash for the designated recipient.

Users pay the cost of transferring and withdrawing money, but there is no charge for depositing money. The graduated withdrawal fee in Kenya for M-Pesa (Box 1) ranges from about 0.5 percent for large transfers to 20 percent for the smallest. Allowable transfers range from US$0.10 to US$770. The costs of transfer are 10 percent for the smallest transfers, falling by half at transfers of US$220, and to 2 percent for US$500.

Mobile money accounts are used for savings, and although they do not pay an interest rate, provide a safer (and more private) means of holding money than “cash under the mattress”. Depositors must also bear the risk of loss of value through inflation. See Section 3.4 on partnerships between Telecoms companies and banks that offer bank accounts paying graduated interest (e.g. M-Shwari in Kenya, see Box 1).

With maturity, many mobile money systems have broadened beyond person-to-person transfers to utility bill payments, retail payments, payment of rents, school fees, transport costs

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15 The merchants may not “agents” in a strict legal sense of having the legal authority to act for the service provider – this depends on the regulatory requirements (see discussion in Section 10).

16 SIM cards are the Subscriber Identification Modules of GSM phones.

17 National Financial Regulators prescribe ID documents for registration to comply with “know your customer” (KYC) regulations (see Sections 9 and 10). In Kenya, to open an M-Pesa account requires one of a Kenyan National ID, Passport, Military ID, Diplomatic ID, or Alien ID. In the rest of East African Community (EAC), there are no universal or national IDs, and a voter’s card, driver’s license, valid passport, local village council letter or certificate, company- or employer-issued ID, government-issued ID, or tax certificate may be used to verify a customer’s identity (Pénicaud and Katakam, 2014).

18 Activation instructions are received in a secure text message. But the role of agents is important in helping customers to activate and execute their first transaction, see Section 9.
(airline, bus and taxi), payment of taxes, licences and fines, and even, recently, purchases of Kenyan government debt.  

### 3.2 Expanding to a business usage and payments platform

The focus in emerging markets has been on domestic transfers based on text messages; in advanced markets the focus is contactless payment systems where consumers transact by swiping their phones on a terminal in a retail establishment. According to Lonie (2013), the key to commercial profitability for mobile payments systems is facilitating technology that allows the inter-operability of payments across different mobile money systems for merchants (analogous to payment systems like Visa and Mastercard). In many developing countries demand for the mobile payments service is still growing but has not reached the critical level for interoperability. A tiered approach, as implemented by Safaricom in Kenya’s “Lipa na M-Pesa” business network, makes customers aware of retail payments, draws them in with incentives, and starts to build a critical mass of consumers using retail payments in one mobile money system.  

Data on business use are limited, but the FITS Uganda study (2012) found 19 percent of mobile money users using mobile money as part of their business, receiving payments from customers or paying suppliers. The Kenyan “Lipa na M-Pesa” network numbered over 139,600 (and 32,000 active) merchants in September 2014. It facilitates customer payments without transaction fees for goods and services below a particular threshold, using dedicated business till numbers. Corporate Kenyan M-Pesa accounts have higher transaction limits than for individuals, and bulk business-to-customer payments can be made. Business usage has grown, and of the average monthly value of payments, P2B (customer-to-business) payments accounted for 10.4 percent and B2P (businesses transferring to suppliers and paying employees) for 8 percent, by mid-2014. The business-related average transfers also exhibited 90 percent growth over 6 months compared to 16 percent for P2P average transfers.

### 3.3 Expanding to government and donor usage of mobile payments

Governments can securely pay policemen and other officials their wages, the national revenue authority can accept tax and licences payments and fines, municipalities can accept parking payments, and public transportation services payments by mobile-money services. They can also be used to deliver social welfare or aid payments with reduced “leakage” and fewer ghost recipients. Some of these payments are a reality in Kenya, through pilots or fully-functioning systems, with M-Pesa and Airtel. However, the government-to-person (G2P) salary and social payments have lagged in Kenya relative to Afghanistan, Tanzania and Malawi.  

Various donor initiatives for provision of basic services have used the technology. M-KOPA Solar, with an operating base in East Africa, in February 2015 closed its fourth round of investment with a US$12.45 million equity and debt offer, led by LGT Venture Philanthropy. They have installed over 150,000 residential solar systems in Kenya, Uganda and Tanzania, and are connecting over 500 new homes daily. Affordable solar energy powered electricity systems are purchased on a pay-as-you-go basis. Users make mobile payments to top-up the credit on their system. After 12 months the cost of their equipment is paid off and the customer owns the system outright with no further payments required.

### 3.4 Credit ratings and micro-loans

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19 [http://www.reuters.com/article/2012/05/04/us-kenya-debt-mobiles-idUSBRE8431E020120504](http://www.reuters.com/article/2012/05/04/us-kenya-debt-mobiles-idUSBRE8431E020120504)
For financial inclusion, the availability of insurance and credit for the unbanked is a key. The difficulty of access for the poor to even small amounts of credit from the banking sector has been described above. But credit requires collateral or other guarantees to bridge the gulf of asymmetric information between borrower and lender. The traditional institutional route to improved loan extension was to create public and private credit bureaux to collect and collate credit, collateral and wage information on borrowers to facilitate the extension of better quality loans. It is expensive to create and man the bureaux and keep records. Mostly they cover a narrow selection of largely firms and some wealthier individuals. “Doing Business”, the World Bank’s website on constraints to business in different countries has a “Depth of Credit Information index” based on aspects of the public and private bureaus and ranked from 0 to 6. The poor score of 2 by Sub-Saharan Africa and below this for many of its countries (June, 2013) is salutary; but the index underestimates how poor the credit information is, because it merely scores the existence and not the effectiveness of these bureaux (a common problem with such qualitative indices, see (Aron, 2000)). In many developing countries, therefore, credit information systems are undeveloped and lenders seldom share information.

The unprecedented growth of micro-credit lending through MFIs (micro-finance institutions) of the last decade has not everywhere been sustainable due to the deterioration of loan portfolio quality, attributed in part to greater competition amongst lenders. With deteriorating risk management, borrower over-indebtedness has increased and also arrears. The lack of effective credit reporting systems to reduce asymmetric information between borrowers and lenders is at the heart of the problem.

Leapfrogging comes into its own again with mobile money, both through a cheaper way of extending and monitoring credit, and through reducing asymmetries of information in rudimentary credit scores calculated from a stream of recorded financial actions by registered mobile money users over a period. For example, the credit agency, Experian, and a philanthropic firm, Cignifi, employ behavioural data of mobile phone users to assess credit risk with as little as a month’s history. They analyse anonymous and encrypted mobile phone data from MNOs, and using proprietary algorithms, identify calling, texting and airtime (and emergency) top-up purchase patterns and habits in order to predict customers’ creditworthiness. This can identify consumer purchasing power and reliability. The scores are dynamic and evolve on a monthly basis. So recent is the phenomenon, that the IFC-CGAP report “Credit Reporting at the Base of the Pyramid” (September, 2011), which describes credit bureaus, credit registries, and MFI-specific systems for exchanging client information for the poorest borrowers, does not once mention mobile money as a possible source of credit scoring.

Users may then qualify for credit – where the mobile service combines with a formal sector bank to allow small loans to be extended. A positive incentive path is developed for progressively larger loans, based on improved ratings each time a loan is successfully repaid. The evolution of the market through technological change, see Section 5.5, should promote easier access to credit underpinned by evolving credit ratings or scores (aided by improved education about credit through accessible applications on the phones).

Currently, according to the State of the Industry Report 2013, there are 17 live mobile money loan products. For example, in Kenya, M-Shwari is a savings and loan product operated entirely from the mobile phone launched in late 2012 by Safaricom and Commercial Bank of Africa, in partnership (see Box 1). M-Pesa subscribers of 6 months standing can apply for an M-Shwari loan sans fees or paperwork: an algorithm based on their M-Pesa transactions history creates an initial credit score and

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20 http://www.doingbusiness.org/data/exploretopics/getting-credit
21 A pilot conducted in Brazil with Oi Telecom found the Cignifi Risk Score is a significant discriminator of default risk: http://www.cignifi.com/en-us/technology/case-study
initial loan limit. Loan disbursement and repayment is via M-Pesa, apparently without loan interest charges, but with a facility fee of 7.5 percent (note, however, that this resembles an interest rate and at a high annual compounded rate of 138 percent). Loans sizes (ranging from US$1 to US$235) have a 30-day term but can be rolled over at a monthly fee of 7.5 percent. Follow-up loans depend on savings and loan repayments history. The service has shown strong growth, and non-performing loans in late 2014 numbered only 2.2 percent of the portfolio.

An important question is how effective these small loans have been. One might expect a significant role for credit for small business that could prove useful for development, and a demand for temporary credit for risk management of households that could raise welfare.

A nationally representative survey conducted by InterMedia found that only 30 percent of M-Shwari users reported taking out a loan (or accounting for the phrasing of the survey question, 39 percent reported using M-Shwari for either a loan or for a future purchase or payment). To qualify for a loan requires a prior deposit in M-Shwari. The high deposit rate but low take-up of loans might suggest that loans are offered but that the loan size offered is unattractive.

These early results can be informed by an in-depth evaluation of the role of micro-credit in small business development from six randomised evaluation studies of six countries on four continents, and in both urban and rural areas (Banerjee et al., 2015). They find modest take-up rates of credit among (prospective) micro-entrepreneurs, and a lack of evidence of transformative effects of credit on the average borrower. However, they point out that the low statistical power bedevilling these studies implies there is also a lack of strong evidence against transformative effects of credit. Their overview does not consider the possible welfare-raising effects of small loans helping risk management by poor households (welfare-raising in this context does not mean income-improving but income-smoothing).

3.5 A micro-insurance platform

The poor have been neglected by traditional insurance products, given the prohibitive costs on delivery. There is also little awareness of insurance policies. Mobile money and its extended products leapfrog the traditional channels of delivery with several business models adopted via the mobile handset. The most popular product is life insurance including funeral expenses, and the remaining quarter provides health insurance, accident coverage, or agricultural insurance. Half of providers allow subscribers to sign up using their mobile. Half charge a premium to customers with automatically set debits, and the rest offer free mobile insurance for achieving stipulated airtime usage levels (the free cover can be boosted and extra features added by paying a premium: the “freemium” business model). Claim disbursements are paid through mobile money or airtime accounts.

As an example, in January 2014, an affordable M-Pesa health micro-insurance product was launched in Kenya by Safaricom in partnership with investment firm Britam and Changamka Micro Insurance. Targeting a million M-Pesa customers, the suggested annual premium of Ksh 12,000 (about US$140) would buy family cover worth Ksh 290,000, for in and out patient, maternity, dental, optical, hospitalization, and in the case of death, funeral expenses.

The State of the Industry Report 2013 (Pénicaud and Katakam, 2014), which covers about 25 percent of mobile providers of insurance services globally, reported 84 live mobile insurance services, of which almost a quarter launched in the year of the report; and another 8 launches were planned, while 7 launched previously, had failed and closed. The adverse selection problem is challenging. The classic mobile money model of delegating to trained third parties in the field with expertise in

insurance, and the appropriate pricing model with incentives, may help these products to be taken up widely.

3.6 Expanding to international (diaspora) transfers through mobile money channels

Migration, guest workers abroad, and the diaspora from civil unrest and war, have fashioned international networks of families, friends, acquaintances and strangers with ethnic affiliations. Significant cross-border financial remittances are repatriated “home” or to refugees, by legal channels or by unlicensed, untracked and illegal means, including Hawala (see Section 5.4). Remittances are economically important in many developing regions.

The cost of sending remittances officially is very high (costs of illicit transfers may be higher). The main channels for official, global money transfer is through companies like Western Union and MoneyGram International. The global average total cost for sending remittances in 2013Q3 was 8.9 percent, but costs vary sharply by region. With high volumes in the Middle East and North Africa, costs have fallen to 6.6 percent; for smaller remittance corridors, costs are exorbitant, e.g. over 12 percent in Sub-Saharan Africa. The World Bank suggests that intra-African transfers are even more costly. Average remittance prices are 20.7 percent and 19.7 percent, respectively, in South Africa and Tanzania; and many banks impose (non-transparent) additional fees on beneficiaries receiving remittances, which can be as high as 8 percent of the transaction value (World Bank, 2013).

There are large potential gains from transparent, reliable and cheaper methods of remittance using mobile money payment technology. There is thus a significant opportunity for mobile money operators to enter this market (currently a minute business internationally). Greater interoperability between bank accounts and electronic accounts as created by M-Shwari in Kenya can help promote international remittances as a mobile money service.

Characteristically, Safaricom in Kenya has been one of the first movers in this new business (Box 1). Kenya received an estimated US$1.5 billion of (recorded) international remittances in 2014 (World Bank, 2014a). Safaricom and MoneyGram International have announced a new service, to be launched in early 2015, enabling the remittances from over 90 countries worldwide to be sent directly to M-Pesa. Safaricom has a similar agreement with Western Union. In late April 2015, it was announced that the Vodafone Group and MTN Group would interconnect their mobile money services enabling affordable international remittances between M-Pesa customers in Kenya, Tanzania, Democratic Republic of Congo and Mozambique, and MTN Mobile Money customers in Uganda, Rwanda and Zambia. This is a fast-growing trend in other countries. In Uganda, MTN Mobile money has partnered with Western Union and international transfers to and from countries where Western Union operates are possible using mobile phones.

4. Greater financial inclusion and mobile money

The term “financial inclusion” is of recent vintage, according to Porteus (2013), entering the “mainstream discourse” only after 2006. It was preceded by micro-economic fieldwork and decades of activism aimed at scaling up micro-credit structures to promote development. The term has gained currency with policy-makers, nationally and internationally, most prominently in the Maya Declaration23 of 2011, when 80 developing nation regulatory institutions from 76 countries

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23 The declaration was made during the 2011 Global Policy Forum of the Alliance for Financial Inclusion (AFI), a Gates Foundation–funded charity initiated in 2008.
collectively endorsed a set of financial inclusion principles. The G20 group of countries has backed the original Maya declaration, and it has endorsed two sets of indicators to measure “financial inclusion” (Section 4.2). The financial inclusion network is expanding: by September, 2014, 53 AFI institutions had made formal commitments to strategies under the Declaration. These embody ambitious, measurable targets spanning several years. For instance, the Bank of Tanzania has committed to increase the share of the population with access to financial services from 27 percent in 2009 to 50 percent by 2015. The role of charitable bodies and multi-lateral organisations in enthusiastically promulgating the ideas, quantification and strategies of financial inclusion has been critical to its current prominence (Section 11).

The proliferation of mobile money services since 2007 has become integral to achieving these targets. We discuss why, and how realistic this is, below.

### 4.1 Defining financial inclusion

There is no standard definition of financial inclusion; but mainstream definitions share the goal of participation in the formal financial sector, rather than in the informal sector (Porteous, 2013). Some define financial inclusion in terms of access to financial services, and others to usage of financial services; more recently these are combined and aspects of quality of services and of financial literacy are added. Some focus on inclusion; and others on exclusion of particular groups. Some are concerned with comprehensive access, and others with achieving stages of access (or a “tiered” access).

The Center for Financial Inclusion (CFI) defines “full financial inclusion” as comprehensive access: “a state in which everyone who can use them has access to a full suite of quality financial services, provided at affordable prices, in a convenient manner, with respect and dignity. Financial services are delivered by a range of providers, in a stable, competitive market to financially capable clients.” The CFI does not itself produce data to evaluate access.

By contrast, the World Bank’s Global Financial Development Report (World Bank, 2014b) which coalesces lessons on financial inclusion bases its definition on usage: “the proportion of individuals and firms that use financial services”. A data-driven approach is adopted to measure inclusion, distinguishing between usage and access to financial services. Exclusion from access could be voluntary through lack of demand for cultural reasons, or because access is indirect through another person. The involuntarily excluded may lack access for many reasons. They may be unbankable because they have too low an income, are a lending risk, or are discriminated against. Or, the governance and regulatory environment and infrastructure may be inadequate, leading to information failures (no credit ratings and ill-informed consumers), poor contract enforcement, insufficient competition in the market leading to price barriers, and regulation that is not enabling. The measurement challenges of usage and access are discussed below.

Some experienced commentators present a cautious perspective. Sensitised by the financial crisis, Porteous (2013) notes that effects of volatility and fragility of the financial environment become more widespread when including vulnerable people in formal sector financial institutions: “The age of apparent innocence about the inherent goodness of providing more financial services for more people has been shattered by the U.S. housing credit bust and by the grim stories coming out of the

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25 The Bank of Tanzania now has an “explicit” mandate for achieving financial inclusion.

26 In late 2013, the World Bank Group President Jim Yong Kim called for achieving “universal financial access” for all working-age adults by 2020.

27 See [http://www.centerforfinancialinclusion.org/about](http://www.centerforfinancialinclusion.org/about), funded by a range of commercial organizations, the Melinda and Bill Gates Foundation and some public bodies.
microfinance sector in certain Indian states.” He argues that financial inclusion is a means to end, and not an end in itself; it is a tool to achieve more robust economies, the application of which needs constant evaluation. The GFDR itself acknowledges pursuit of financial inclusion for its own sake may be pointless: for instance if most measured new bank accounts are simply inactive accounts or if too liberal a credit extension leads to heavy indebtedness, housing foreclosures and even systemic instability.

Porteous also challenges the bias to formality in the definition of financial inclusion. The economics of formal sector banking: loan defaults with asymmetric information about borrowers and no credit ratings; limited collateral available against loans; small amounts transacted by the poor; and exorbitant costs of servicing sparsely-populated rural regions with bank branches, has severely constrained any progress.

Access to and usage of electronic mobile money has typically not been counted as part of financial inclusion under most definitions. Mobile money’s role is supposed to be as a pathway for registered users to formal sector financial inclusion via products (insurance, credit and a bank account that pays interest on savings) accessed through a mobile phone. Yet mobile payments technology has transformed the lives of vast numbers of poor consumers who can hold recorded cash privately in non-bank electronic accounts and regularly perform financial transfers, easily and cost effectively. Moreover, such users may not embrace the formal sector products even if they become available; and if they can thereby access credit, these may be very small loans that are not adequate to purpose, creating a disincentive to participate (see Section 3.4).

Indeed a “tiered” definition of financial inclusion would seem more appropriate, with “semi-formal” initial tiers counting towards inclusion. In practice, this has begun to happen. Finscope defines financial inclusion to the “formal sector” in its recent surveys, distinguishing between prudentially-regulated and non-prudentially-regulated formal sector institutions (e.g. mobile money providers that are telecoms), thereby including mobile money in the definition of “formal” financial inclusion. For instance, The Bank of Uganda has a Financial Inclusion programme under the Maya Declaration, now in its third year, and aims to “to increase access to financial services and empower the users of financial services to make rational decisions in their personal finances so as to contribute to economic growth.” As acknowledged by the Governor in 2014, referring to the third Finscope survey in Uganda (2013), the recorded rise from 28 percent in 2009 to 54 percent in 2013 of the adult population with access to “formal financial institutions”, is largely attributable to mobile money. Similarly, in Tanzania, well on the road to achieve the 2016 goals, many of the goals are measured through the establishment of electronic mobile money accounts (as well as the potential access they give to broader banking and insurance formal services).

28 The Mzansi low cost bank account, launched by the South African banking industry in October 2004, helped raise the percentage of banked adults from 46 percent to 63 percent between 2004 and 2008. By December 2008, over 40 percent were inactive or closed.
29 For instance, the indebtedness crisis facing the private micro-credit industry in 2010 in several Indian states such as Andhra Pradesh.
30 Note that the non-prudentially-regulated telecoms may not intermediate customers’ money themselves, and the escrow accounts fully backing customers deposits as in Kenya and Uganda are prudentially-regulated.
31 On the Bank of Uganda’s Financial Inclusion Project, see Strategy Paper on Financial Inclusion (Bank of Uganda (2013)).
32 A speech, Regulatory Challenges in the use of ICTs to promote Financial Inclusion, Prof. Emmanuel Tumusiime-Mutebile, Governor, Bank of Uganda, 21 August 2014.
33 Formal is here defined as: “access to and use of financial services from regulated and registered financial institutions. These include banks, mobile money providers, microfinance Institutions and SACCOS (National Financial Inclusion Framework, 2014-16, Tanzania National Council for Financial Inclusion).
How meaningful are the quantitative metrics that monitor the achievement of such “re-defined” financial inclusion goals? Are these active or inactive mobile money accounts; and when they give access to credit, is this meaningful and useful credit extension from the perspective of the consumer? We consider this below.

4.2 Measuring financial inclusion - and the recent role of mobile money

The measurement of financial inclusion is thus in a state of flux. We discuss the evolving measurement of financial inclusion with reference to Appendix Table A1. Details of the datasets (and associated websites) are included, and it differentiates amongst provider-based data and types of usage data, indicating also where mobile money is covered.

For many years, in keeping with the bias to formality, the only internationally-comparable indicators of financial inclusion (defined as in “access”) were supply-side financial data sourced from national financial sector providers. Examples of large-scale supply-side databases are the IMF’s Financial Access Survey (FAS) and the World Bank’s Global Financial Development Database (GFDD), see Table A1. These data cover infrastructural density statistics for banks, insurance products, branches, ATMs, and mobile money agents. There are demographic statistics on bank depositors and borrowers and mobile money customers. There are data on flows and stocks: the sizes of bank assets and liabilities, and mobile money account balances. The IMF’s annual data have, since 2014, included mobile money data. The 2011 Global Findex contains two questions on mobile phone payments and transfers. Supply-side data relevant to international remittances, payments and regulation for mobile money in 2010, are contained in the World Bank Global Payments Survey. Focusing solely on mobile money are the GSMA’s Global Mobile Money Adoption Survey and Mobile Money for the Unbanked (MMU) Mobile Money Deployment Tracker, see Table A1.

The supply-side access data are helpful when there are sufficient data to compare trends within a country, and trends across countries with similar income levels and other differences such as insecurity (e.g. to compare Afghanistan and Burundi), and especially where statistics are expressed relative to a comparator benchmark like per 100,000 adults or per geographical area. Disaggregated data by income group, education, gender, demographics, and by region (including urban versus rural sectors), would be more informative. Useful, for instance, is the FAS data aggregated on the largest three cities in the country. Possibly providers are reluctant to give detailed information for commercial reasons. But monitoring the spread of mobile money, for instance, requires more geographically detailed data on active agents and active accounts for countries such as Niger and others in West Africa, where inclusion is constrained by an inadequate agent network (Aker et al., 2014). Recognising this, donors have stepped into the breach and funded an innovative link between provider data on financial access point locations (including mobile money agents) and a map of demographic and poverty data to a 1-kilometer resolution, to measure and track financial access with greater accuracy (see Fspmaps, Table A1).

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34 There are very useful online resources on data, see CGAP, Data Architecture of Branchless Banking, http://www.cgap.org/blog/series/data-architecture-branchless-banking and http://www.cgap.org/blog/10-useful-data-sources-measuring-financial-inclusion

35 The IMF’s annual data from 2004 are collected from 189 reporting jurisdictions and comprise currently 152 time series and 47 indicators.

36 Annual supply-side data on the number of registered and number of active agent outlets per population or area; number of registered and number of active accounts (and per population); number and value of mobile transactions (and per population); and finally, the stock of outstanding balances on active mobile money accounts.
But although what is available in terms of infrastructure and the apparent access for some users via accounts opened is indicative, it gives only a partial picture on financial inclusion. These data have to be interpreted carefully. It is worth noting that in an analogous large literature on the influences of institutions on investment and growth, the appropriate institutional variables to include are those that capture the de facto performance, effectiveness of implementation, or quality of institutions, and not merely their de jure characteristics or attributes (surveyed in Aron, 2000). In the present context, it is unclear whether numbers of accounts are active or inactive; whether numbers of loans are productive or non-performing; and whether the un-weighted loan balances given are mainly swelled by a few large loans to big business in urban areas. There is also no information on the quality of financial services offered, only that there are services. Interestingly, there is an exception for the new mobile money FAS data (as of 2014), where the word “active” appears to describe accounts and agents, giving a sense, albeit limited, of the effectiveness of the access. Simply increasing numbers of bank branches and loan officers and loans, therefore, if they are not performing effectively, may not aid inclusion and simply give rise to misleading statistics. Porteous (2013) argues that it is critical to ensure that products and services that are developed are truly meeting clients’ needs while providing a robust business case for providers.

The provider-supplied density indicators have only recently been supplemented on a global scale by user data from surveys, such as the World Bank’s Global Findex survey (2011)\(^37\) compiled for 148 countries using the Gallup World Poll Survey. The demand-side financial data ranges from globally comparative cross-country data to country-specific surveys, see Table A1. The Gallup Payment Survey covers 11 African countries, and is adding Asian countries. The FinScope surveys conducted by FinMark Trust cover 6 countries for SME surveys and 18 countries for consumer surveys. The Financial Inclusion Insights (FII) and Financial Inclusion Tracking Surveys (FITS) cover several Asia and African countries. All contain information on branchless banking and mobile money. Measuring or calibrating the effectiveness and quality of institutions is usually accomplished with surveys. For instance, the ease of doing business given regulations and the effectiveness of de jure property rights are subjectively ranked in cross-country surveys conducted by the credit rating agencies.

Gathering these types of approaches together, the G20 leaders in 2012 endorsed the “G20 Basic Set of Indicators” and later in 2013 an expanded set of indicators, the “G20 Financial Inclusion Indicators”, to measure access to, use and quality of financial services. These indicators are a selection of those prepared by the IMF in its annual Financial Access Survey (FAS) of providers, by the World Bank from its 2011 Global Findex Surveys\(^38\) of users of financial services and Enterprise Surveys, and supplemented for a narrow set of countries by OECD survey information on financial literacy. This is indicative of a new endeavour on harmonized, comparative and extended data across countries including further measures on quality and on barriers to access and usage. However, note that the basic set excludes mobile money and is focused on formal financial institutions; the extended set contains one question on mobile money payments, see Table A1. The Financial Inclusion Data Working Group of the AFI is making broadly accessible this type of coordinated exercise, and including mobile money.\(^39\) The view from CGAP is that the future more detailed financial inclusion data incorporating mobile banking and payments data will be collected by regulators (including the central banks).

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\(^{37}\) These include data from financial capability surveys, living standards and measurement surveys, and enterprise surveys. Two studies using Global Findex data to assess financial inclusion are Beck et al. (2015) and Klapper and Singer (2015).

\(^{38}\) Updates are planned for 2014 (due to be published in 2015) and 2017.

\(^{39}\) On AFI Core Set of Financial Inclusion Indicators on access and usage and Second Tier Indicators, see Table A1.
In summary, great efforts are being made to standardise and integrate user, demand, and qualitative data, and mobile money data are just beginning to be included. However, a strong bias to formality remains, and mobile money data is missing or limited in many datasets. As we have indicated, and see Table A1, definitions of “formal” and “financial inclusion” may not coincide across data providers; and generally, lack of standardized definitions for demand data can imperil comparability. With the effort for extended data sets, it is important that harmonised definitions and sets of indicators for mobile money may make their appearance, for comparisons and transfer of policy lessons across countries. Data issues are discussed further in Section 7, where the specific interest is the use of mobile money macro-data for modelling expenditure; and of mobile money micro-data for research on adoption and on the economic impact of mobile money, as surveyed in Section 8.

4.3 Adoption, usage and awareness patterns – what do they show?

Selected econometric research on the drivers of adoption is surveyed in Section 8. However, generally, the data problems and issues of identification of the influences on adoption have deterred rigorous economic analysis, focussing adoption studies on qualitative aspects, including diffusion of the technology, and largely conducted by non-economists.

For instance, a review of the literature by Slade et al (2013)\textsuperscript{40}, from a marketing perspective, examines extensive adoption research evidence on the mixed success of m-payments in advanced countries. The most research is on the US, China, Germany, Switzerland and Finland, but none extant on the UK. Much of this research in their view failed to generate representative samples. The earliest study dates from 2002, but burgeoning research from 2007 covers two-thirds of their review. The application of various mobile payment products has been less successful in Europe and North America than in Asia, with low adoption rates. Cultural differences matter and successful business models need adaptation to address differing economic, technological and social market constraints. They find that “a multitude of complex and interrelated factors affect adoption of m-payment systems”. There are also feedback effects where technological developers and users react symbiotically to changes made by the other. This naturally complicates modelling adoption. Moreover factors may differ for adoption in the two main types of mobile payments, proximity payments using the phone and a payment device (including Near Field Communication (NFC)) and remote (wireless) payments. The factors isolated by researchers that positively affect adoption include perceived ease of use, perceived usefulness, compatibility, interest in m-payments, social influence, use context, payment scenario, and trust. Those negatively affecting adoption are costs, risk, and attractiveness of alternative payment systems. However, a significant proportion of the existing research has failed to be validated empirically. The drive to acquire a mobile phone may not be matched by enthusiasm for the application, therefore, especially where merchants need to invest in technology and users need an enabled phone (NFC).\textsuperscript{41}

The patterns and correlations for adoption, usage and awareness of mobile money are closely linked to understanding financial inclusion. There are a growing number of surveys in cross-sections and panels, and the integration of administrative data with interviews, that reveal the characteristics of adopters of mobile phones, mobile banking and mobile money, and how the trends evolve with development of the markets and products.

\textsuperscript{40} This paper updates previous exhaustive literature reviews relating to mobile payments (Dahlberg et al., 2008; Karnouskos, Kauffman, Lawrence & Poustitchi, 2008).

\textsuperscript{41} The smartphone has been widely taken up, with Apple Inc. achieving the highest profits in the last quarter of 2014 ever achieved by a company, and due to sales of the I-Phone 6 smartphone in China (see also Section 5.5). Apple’s particular mobile payments technology, linking with credit card providers, has exploded (see Section 3).
To gain a more detailed perspective on a representative advanced country, the US, and particularly of the adoption and use of mobile payments by the unbanked and under-banked, we summarise selected findings of the US Federal Reserve’s annual survey of Consumers and Mobile Financial Services (Federal Reserve, 2014). The unbanked and under-banked US consumers comprise 11 percent and 17 percent shares, respectively, of all US consumers. Annual surveys for 2011, 2012, and 2013 find the share of unbanked consumers has remained roughly constant. The main factors deterring adoption of mobile banking and payments amongst all consumers are security concerns and preference for existing methods for banking or making payments.

Amongst the unbanked and under-banked, the ownership of mobile phones, and specifically smartphones, is high: of unbanked individuals, 69 percent have access to a mobile phone of which half are smartphones; of the under-banked, 88 percent have a mobile phone, 64 percent of which are smartphones. The relatively high prevalence of mobile phone and smartphone use amongst the youth, minorities, and low income groups, suggests mobile phones could expand financial access of the unbanked or under-banked. However, use of both mobile phones and smartphones increases nearly linearly with income.

The use of mobile banking in aggregate increased substantially in 2013. The convenience of mobile banking overtaking smartphone adoption as the driving force behind mobile banking adoption. Some 72 percent installed mobile applications to conduct their banking transactions. Reinforcing previous findings, minorities continue to be more likely to adopt mobile banking. The under-banked population makes substantial use of mobile banking. Almost 39 percent of the under-banked with mobile phones report using mobile banking in the past 12 months, while 22 percent report using mobile payments. Use of mobile banking continues to be highly correlated with age.

Overall, US mobile payments usage increased only slightly from 2012 to 2013. Usage rose among all mobile phone users from 2012 to 2013, with 17 percent reporting using mobile payments. For smartphone users, usage remained at around 24 percent for three years. The implication of this constant rate is that smartphone adoption substantially contributed to the increased use of mobile payments. The main reason most people adopted mobile payments was convenience (37 percent), followed by getting a smartphone (26 percent). As with mobile banking, there is no clear correlation between payments usage and income or education level amongst those who own a mobile phone. Payments usage significantly lags mobile banking usage for the banked and under-banked consumers. Yet mobile payments are disproportionately used by younger consumers, suggesting this may be a growth area.

The main focus of mobile payments is retail purchases (mainly point-of-sale), increasing substantially in both 2012 and 2013, with substantial growth potential when more retailers and businesses are able to accept them at point-of-sale. The extent of payments and receipts via mobile banking indicates the potential substitutability towards mobile payments technology. About 44 percent of mobile banking users made online bill payments from a bank account using a mobile phone, and 38 percent deposited a cheque by phone in 2013. Users reported an interest in incentives for payments usage, such as discounts, coupons, and promotions and tracking rewards and loyalty points.

Some of the above findings are paralleled in poorer, cash-based countries. However, unlike advanced countries where there are worries about security and mobile money faces competition from entrenched financial products, there are few competitors in developing economies and mobile payments instead is a cost-effective and relatively secure solution to a gap in the market for transfers and payments. Far smaller amounts are transacted, and bank accounts are typically not involved. Nevertheless, the adoption of mobile money has been variable, though sometimes rapid, as in East Africa. Globally for the unbanked, excluding advanced economies (see Pénicaud and Katakam, 2014, Appendix A), of the total product mix by value, airtime top-up comprises 9.4 percent, bill payments
comprise 10.8 percent and domestic private transfers, 68.3 percent; and there are an average of 1.3 transfers per active user per month with an average value of US$38.

With the remote payments technology used in mobile money, a pre-requisite for adoption is access (not necessarily ownership) to a mobile phone. Blumenstock and Eagle (2012) examine the characteristics of mobile phone owners in Rwanda using interviews (2009) merged with detailed, transaction-level call histories (to 2008). A third of Rwandans in the sample share their phones. The owners are much more likely to be male, better educated, from larger households, and substantially wealthier than those without mobile phones. Focusing on owners, the highest income quartile used their phones 30 percent to 100 percent more than lowest income quartile, depending on the measure of use. There is also a difference in usage by gender, particularly in reported phone sharing and the types of calls made.

A related study of adoption of mobile phones and usage analysis in cash-dominant East Africa at around the same time has similar findings (Aker and Mbiti, 2010). As a result of scepticism of the validity of causal analyses with poor data and misspecifications (see Section 8.1.2), they restrict themselves to examining mobile phone adoption correlations using firm surveys and household surveys. They find that for East Africa (Kenya, Tanzania and Uganda) during 2003-2008, that adoption of mobile phones by firms appeared to be correlated with the implicit and explicit costs of poorly functioning landline services. Adoption by households in Kenya in 2003 was markedly lower than that for firms, and it appeared that in 2006, the young, male, educated, wealthy, bank account-holding and urban, were the primary adopters. By 2009, perhaps due to cheaper phones and lower denomination airtime cards, the percentages of rural, older, poorer and female users had increased, but without disturbing the preceding pattern. Turning to mobile money use, on average, M-Pesa senders and recipients in 2009 were the wealthiest, younger (under-55), better educated, and “already banked” male (see their Table 2), with most transfers occurring within urban areas. The gender differences for recipients were not large, but more males were recipients and senders. In 2009, while just under a third of those surveyed (sample is 6598) were users of M-Pesa, only about 4 percent paid bills using M-Pesa. This has strongly changed with time (Box 1). The later econometric study for East Africa by Weil et al. (2012), see Section 8.1.2, does not overturn these findings, but does not reach conclusions on gender.

A broader snapshot from a 2011 Gallup survey, details mobile phone ownership and payments and transfer behaviour in 11 Sub-Saharan African countries (Godoy et al., 2012), see Appendix Table A1. Phone access was broad with even the poorest 20 percent in these countries owning or having access to a mobile phone (ranging from 81 percent in Zambia to a low of 38 percent in Mali), with similar figures for those surviving on less than $1 a day. They found that 53 percent of adults (or 134 million people) had received a payment from someone at a distance in the past 30 days. Startling was the finding that a total of 60 percent (79 million people) exclusively use cash-based channels such as informal couriers or sending money by bus. They confirmed for electronic payments (which include bank payments in their survey) the above patterns for age, education and the salaried, and again found little gender difference. The importance of mobile money for domestic transfers in East Africa is evident (their Figure 11), with percentage shares below 6 percent for all other countries, except South Africa (13 percent) and Botswana (8 percent), which have competing well-developed bank channels. Receipt of international remittances and domestic bill payments specifically via mobile payments was not documented. They would be interesting to track henceforth. Confirming the discussion in Section 3.3, their Figure 29 shows that except in Botswana (6 percent), Tanzania (5

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42 These are: World Bank Enterprise Surveys (firms); and FinAccess surveys of households for Kenya, 2006 and 2009.
43 Percentage shares are Kenya (90 percent), Uganda (68 percent) and Tanzania (60 percent).
percent) and Kenya (2 percent), payments by governments and employers are not much utilising the mobile money channel (in South Africa, they again predominantly used bank transfers).

A different set of surveys on Tanzania, Uganda, and Pakistan, three-year annual panel studies, has, inter alia, interesting revelations of the growth in business use (Financial Inclusion Tracker Study (FITS), see Appendix Table A1). In the more advanced markets, between a fifth (Uganda) and a third (Tanzania) of users use mobile money for business transactions. Most (about three-quarters) of these use it to pay suppliers, one quarter to receive customer payments, and a small percentage (7 percent in Tanzania) pay employees’ wages. In Kenya, see Box 1, the institutional structure has been created with several incentives to promote the “Lipa na M-Pesa” network which numbers over 140,000 merchants and is a growth area for M-Pesa.

Finally, there are studies tracking greater awareness of financial services over time. For example, an awareness study by research consulting group InterMedia tracked 2000 Tanzanian adults (aged 15 and older) in Tanzania for a year from September 2011, in quarterly surveys (see Appendix Table A1). In the fourth wave of the study, 99 percent of the adults were aware of at least one mobile money service, and 82 percent had seen or heard a mobile money advertisement in the preceding month. In the fourth wave as compared to the first, 45 percent rather than 24 percent were active users (used mobile money services at least once in the past 90 days). There was also greater awareness of different mobile phone operators. It is not clear if the same individuals were interviewed in each wave, in which case one would expect the study itself to have raised awareness making it difficult to draw firm conclusions.

**5. The growth of the industry, its profitability and geographical spread**

**5.1 Trends in the Growth of Deployment**

The global growth of the mobile money industry has been meteoric. The first mobile money service scheme was launched in 2001 (see Figure 3), and after five years, there were 6 schemes globally. The rapid growth of MPESA, launched in Kenya in early 2007, has catalysed the spread in African countries. African growth has since dominated the global rise (Figures 3 and 4), and mobile money services are taking hold in Latin America, East Asia and South Asia. By the end of 2013, there were 219 services in 84 countries, with 113 proposed new mobile money services (Pénicaud and Katakam, 2014). By December 2014, there were 255 live mobile money services across 89 countries; Sub-Saharan Africa accounted for 53 per cent of these, but half of new launches in 2014 occurred outside of this region (Scharwatt et al., 2015).

The geographical expansion by provider is another striking feature of the industry, creating mobile money “multi-nationals”. For instance, Vodacom, based in South Africa and majority owned by Vodafone, introduced M-Pesa in Kenya in 2007, in Tanzania in 2008, in South Africa in 2010 and Mozambique, Egypt and Lesotho in 2013. Vodafone launched a mobile money service (M-Paisa) in Afghanistan in 2008 (partnered with an MNO, Roshan), in India in 2013 (in a partnership with ICICI Bank), and in Romania in April 2014. Other mobile money services with significant cross-country market presence include Airtel Money (available in 16 African countries including Kenya, Tanzania and Ghana); and MTN Mobile Money (available in 15 African countries including in West Africa and South Africa).

Regional growth of registered mobile money accounts per 100,000 adults, with clear Sub-Saharan African and North African dominance, is reported for the past three years by the GSMA State

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44 In 2013, mobile money schemes began in nine new markets: Bolivia, Brazil, Egypt, Ethiopia, Guyana, Jamaica, Tajikistan, Togo, and Vietnam.
of the Industry Report (Pénicaud and Katakam, 2014), see Figure 4a. Registered mobile accounts can be differentiated by active and inactive accounts, illustrated since 2010 in Figure 4b with “active” defined as enacting at least one transaction in the prior 90 days. By June, 2013, of the 203 million registered accounts, just under one third was active (61 million). The challenge of activating accounts is important for profitability, see below.

Even faster growth occurred in unregistered mobile money users, amounting to 17.3 million users in total by June, 2013, with four services exceeding 1 million unregistered users (Pénicaud and Katakam, 2014). South Asia has 88 percent of global unregistered customers, and this is down to an over-the-counter model where the challenges and costs of establishing identity in registering were circumvented in favour of a drive for early market share. However, registering customers is important for financial inclusion reasons (Section 4).

Differentiating between active and inactive accounts, registered and unregistered users, and the fact that a user may have several accounts, are important data considerations in empirical work and for informed policy decisions, and this is discussed in Section 7.

Within-country growth can be illustrated by the East African examples. For Kenya since 2007, see Box 1. Uganda’s mobile money industry, a later starter in March, 2009, has grown rapidly, though not at the pace that Kenya has recorded (Aron et al., 2015). Mobile money was first introduced by MTN, then the biggest of the mobile telephone operators in the country, and the market is today served by six operators. There were about 18 million registered subscribers by September 2014 (almost doubling since the end of 2012). By mid-2014, the value of monthly mobile money transactions was around Shs.2 trillion (quadrupling since the end of 2011), and the total annual transactions divided by the current GDP in 2013/14 measured about 37 percent of GDP. MTN has remained the largest provider, with 90 percent of the value of transactions by end-December 2013, though only 36 percent of registered customers. The total annual volume of transactions rose by 1300 percent from end- 2010 to almost 400 million transactions three years later. With financial institutions defined by Finscope to include mobile money services, there has been a rise from 28 percent in 2009 to 54 percent in 2013 of the adult population with access to “formal financial institutions” in consecutive surveys (Appendix 1).

In Kenya, the growth in diversity of services toward sophisticated business networks with incentives, and new ventures joint with money transfer companies for international remittances, by Safaricom, is indicated in Box 1 and in Section 5.2. With it has been an almost 40 percent expansion in the agents’ network. Such sprinters contrast with other services which have had lack-lustre or slow growth so that Pénicaud and Katakam (2014) refer to a “two-tiered” pattern of performance.

The rise of mobile money services in sprinters has been favoured by several factors including the regulatory and competition framework, and political stability. As notable as the boom in African growth in mobile services, is the relatively lagged growth for Latin America.

5.2 Profitability

Mobile money is a young industry, with three-quarters of the 255 mobile money services launched after mid-2011 (Mobile Money Tracker, January, 2015). However, by 2011, only one scheme (MPESA) had achieved operational profitability. The benchmark to break even and show profit is

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45 An example is Easypaisa, a mobile money service in Pakistan, which serves more than 5 million customers a month through 25,000 points of service (Pénicaud and Katakam, 2014, p21).

46 See their Figures 4 and 5: they measure performance by the ratio of transactions (excluding airtime top-ups and cash in-cash-out) to the size of the addressable market (mobile subscribers for MNOs).

47 For instance, mobile coverage and penetration is poor in countries with state-owned telecoms monopolies and civil unrest (e.g. in Ethiopia and the DRC mobile penetration rates are, respectively, 22 percent and 25 percent).
about a million active subscribers, each performing at least one transaction per month (Lonie, 2013). Yet, since 2011, few mobile deployments have “reached scale”: only 13 services have more than a million active users, seven of which passed this threshold between June 2012 and June 2013 (Pénicaud and Katakam, 2014).

Villasenor (2013) expects a nascent, high-opportunity industry to attract more entrants in the early stages than the market can support. Mergers (as in Uganda) may strengthen the market sway of struggling low share operators, see below. A “two-tier landscape” of “sprinters” and the slower growers has been noted by Pénicaud and Katakam (2014); however, they suggest in this rapidly evolving market that lessons from successful sprinters may transform profitability for others in due course. They note, furthermore, that almost three-quarters of their 2013 survey respondents planned to increase their investments in mobile money in the subsequent year.

Consequent on competition and falling prices for telecoms services such as calls, mobile money has helped support revenue and encourage customer loyalty. Pénicaud and Katakam (2014) analyse the proportion of revenue generated from mobile money for MNOs, based on a sample of 69 MNOs, in June 2013. For 5 operators, over 5 percent of total revenues were generated directly by mobile money. The Vodacom subsidiaries in Kenya and Tanzania each generated over 18 percent of total revenues from mobile money. There are also important indirect revenue benefits, such as savings on airtime distribution. For 10 operators in the sample, more than 10 percent of their airtime was sold via mobile money, totalling US$19 million in June 2013. Another indirect benefit is reduced customer “churn”, where mobile money use generates savings from customer loyalty, though in more competitive markets offering similar products, this may become less important. Some services have found the reduced churn to add considerably to revenues (e.g. in Leishman (2011) found that savings from airtime distribution, reduction in churn, and increased share of wallet for voice and SMS combined to account for 48 percent of MTN Uganda’s gross profit to date).

What accounts for the difficulties in reaching profitability? Unless a critical mass of clients adopts mobile money and they have active accounts, a vicious circle can arise as a short-fall in cash flow complicates coverage of operational costs, and induces a disincentive to further investment. Di Castri (2013) argues that the success of a deployment is influenced both by internal and external factors, through the way they affect (active) adoption. Internal factors include levels of investment in mobile money and organisational structures, and the customer acquisition and distribution strategies. External factors include the levels of mobile penetration, different socio-economic factors, competition, and the regulatory architecture. On the internal factors, Lonie argues that many banks and mobile operators have failed to appreciate that mobile money is not just an add-on, closely aligned to their core business and able to use existing infrastructure. Instead it requires expensive investment in new teams and in new operational procedures and marketing. Central to the success of mobile money in the early stages is creating, training, incentivising and monitoring a widespread agents’ network. Customers also need a significant marketing effort and education in how to use the service. Successful adoption seems to be linked with whether accounts, once registered, will be active or inactive; and this too depends on agents’ incentives at registration and thereafter. (Agents’ networks and lessons from successful incentive structures are discussed in Section 9.)

Safaricom’s recent strategies toward sustained profitability in Kenya are illustrated by the first half year results for 2013-14. M-Pesa contributed 18 percent of company revenues, but was the largest individual contributor to direct costs, at 20 percent of costs (KSh5 billion (about US$55

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48 Susie Lonie is credited with being one of the creators of M-Pesa, when employed by the Vodaphone Group.
49 Agents’ commissions for cash-in, a necessary prelude to topping up using mobile money, are typically below the discounts for selling airtime to the channel; costs are further saved in the scratch cards otherwise used for top-ups.
million). This was due to M-Pesa agents’ commissions and the expansion by 33,316 outlets to a total of 78,856 agents in March 2013. Their current strategy is to increase digital transactions between visits to agents and thereby raise revenue without raising costs. The company is heavily encouraging diversity in payments by promoting services such as rental payments through Lipa Kodi from tenants to landlords, and the “Lipa na M-Pesa” network of merchants with incentives for payments by customers and to suppliers, and including bulk payment disbursers by businesses, see Box 1. The rise of business usage of M-Pesa is now driving growth, see Box 1.

Diversification to more complex products such as micro-insurance needs a specially trained sales force and consumer education, and insurance has not yet been sold through mobile money agents but rather via partnerships with insurance companies (e.g. see Box 1 for Kenya). MMU reports 30 launches in 2012 and 2013.

A key external factor is regulation. The relatively recent and piecemeal establishment of mobile money services in many countries has led to different regulatory approaches. Some have been highly restrictive, as regulators confront new challenges posed by new technology (e.g. South Africa). Where banks are involved as partners (or sole issuers) of mobile money, they are disinclined to challenge inappropriate and heavy-handed regulation, even if unsuited to the low risk associated with low value transactions. Lonie (2013) argues that this is because they are by nature cautious and risk averse, don’t wish to jeopardise their own complex relationships with the regulators for core banking operations, and are unclear on the risks posed by mobile money. On the other hand, Lonie argues that mobile operators, though more entrepreneurial, unfortunately mostly do not have the internal capacity to understand and challenge inappropriate financial regulation. Charities and donors have had an important impact, therefore, in drawing out and disseminating the lessons from facilitating regulation. (In Section 10, we explore the regulatory approaches that are deemed most successful to encourage a profitable take-up of mobile money services.) Further, where there are formal partnerships between mobile operators and banks, banks prefer regulation that reduces the potential costs to business posed by mobile money. There are frequent instances of dissent and misunderstandings, as in Kenya’s attempt to partner with the Equity Bank in 2010 with a product called M-KESHO (see Section 8.1.5).

5.3 Competition in the Markets

It is widely recognised that there are first mover advantages in establishing mobile money services due to the “natural monopoly” features in creating the infrastructure. A dispensation may be granted to the first mover to compensate it for the initial investments to establish the industry, such as exclusive contracts with its agents’ network. But ultimately, as other companies are established to challenge the incumbent, competition policy from the regulator will have to erode exclusivity and evolve toward greater “interoperability”, with the advantages this offers to consumers and provider-companies alike. The early agent exclusivity arrangement in M-Pesa was formally outlawed in July, 2014 in Kenya. The Central Bank of Kenya ordered Safaricom to open up the M-Pesa agent network to other operators in a bid to improve fair competition and encourage lower fees for customers. In Uganda, the 2013 guidelines outlaw agent exclusivity.

The mobile phone market structure has itself has evolved from monopolies in the mid-1990s to largely deregulated markets, for instance, in Africa, partially or fully deregulated markets dominated monopolies by about 2004 (see Aker and Mbiti (2010), Figure 4). The mobile money markets for the unbanked too have become increasingly competitive, especially in Sun-Saharan Africa and Asia. By mid-2013 there were 52 markets with two or more mobile money services, compared to 40 at the end of 2012 and 33 at the end of 2011, and 27 markets with three or more services (Pénicaud and Katakam, 2014). Most new deployments in 2013 were launched in markets with existing mobile money services. On the other hand, there have been mergers between small companies, such as the
reduction of players in Uganda’s incipient market from five to four with the 2013 merger of Warid and Airtel, creating a sizeable competitor for the dominant MTN.

Greater competition is expected to improve quality, variety and innovation of products for consumers as well as to reduce prices. Most current mobile money systems are not integrated with others and electronic money has to be converted to cash on one system before it can be sent on another. The expectation in the industry is that the increased competition will spur interoperability (see Section 10.2).

5.4. Possible competitive effects on Hawala, and illegal or unlicensed international remittances

The old-age method of informal and unregulated money transfers based on trust, and effected through close ethnic or family networks, is called Hawala. Hawala is an Arabic word meaning “transfer”, but is by no means confined to Arabic countries. Overwhelmingly, Hawala is “illegal”, as in “unlicensed”, although sometimes it is tolerated. Its essence is that money does not physically travel, and the international transfer of the money is almost immediate.

The widely-prevalent Hawala systems are interesting for a survey on mobile money. If licenced mobile money systems for cross-border transfers with low transactions costs increase their current tiny share of the market (see Section 9.4), this could create considerable competition for Hawala, as the users of the two services intersect strongly. Western Union and other registered money transfer companies have cut costs in recent years, already providing limited competition for Hawala. This could transform the role of the unlicensed Hawala.

In its modern variant a client approaches a banker and is provided with a code in exchange for a sum of money. This code is provided by the client to the recipient in a different location (country) by telephone; and this code, on being presented to a local “banker” in the same Hawala network in the new location, also contacted by telephone, results in the transfer of the cash.

Hawala is heavily used by migrant workers (Van de Bunt, 2008). It is particularly prevalent in war-torn countries, and in those with poor infrastructure. Several authors have investigated the phenomenon in Afghanistan, Somalia, Pakistan, amongst other countries. Thompson (2006) asserts that there were 900 Hawala bankers in Afghanistan while there were only 13 formal banks. Typically it is a flat network, not hierarchical, with clients and bankers sharing a narrow ethnic background. The coherence and success of the network relies on discipline through trust. Discipline is not induced through violence; rather, misbehaviour is punished by exclusion from the network.

Varese (2014) documents the characteristics of a formerly long-lived pure Hawala network, which “diversified” out of purely family/ethnic networks into riskier international and multi-ethnic activities, including drug money carrying and laundering. This was induced by economic pressure from competitive methods of money transfer, and the emigration of migrants in economic downturns. Using criminal prosecution records and transcripts of telephone conversations that led to the arrest of the Hawala bankers, he finds that the expanded networks became hierarchical in nature and disciplined through threats of extreme violence.

Concerns about security and money-laundering in specific countries has constrained the adoption of mobile money for efficient and low-cost international transactions, see Section 9.4. Yet licenced money payments organisations are bound by “know your client” legislation, and require identity documents. Chatain et al. (2011) give guidance on complying with international anti-money laundering (AML) and combating the financing of terrorism (CFT) standards, but with sufficient flexibility for mobile money to thrive.

5.5 The future: cheaper smartphones and technical innovation
The rapid uptake of mobile phones in the developing world began with basic feature phones without touchscreens, internet access, access to “apps” and other features of the smartphone. The basic feature phone has limited functionality. It has been adequate to execute simple financial operations, mainly the transfer of money using first generation “sim texts”. Where financial service provision has expanded, as in Kenya, even simple feature phones have allowed cash withdrawal at ATMs, payment of bills, access to interest-bearing savings accounts and insurance products, and access to small loans (see Section 3). But while the basic feature phone provides the “platform” for these services, the interface remains restrictive, and it is challenging for those with limited literacy to operate the more complex services.

Villasenor (2013) suggests that the more flexible display and user interface options in a smartphone could be leveraged to help surmount literacy barriers, further expanding the reach of mobile technology. Smartphone sales grew globally at 36 percent in the last quarter of 2013, and at 42 percent in 2013 as a whole. They accounted for 54 percent of overall mobile phone sales in 2013, exceeding annual sales of feature phones for the first time. Leading the growth were Latin America, the Middle East and Africa, Asia/Pacific and Eastern Europe: smartphone sales grew by more than 50 percent in the last quarter of 2013 (and in India, alone, grew by 167 percent). China’s smartphone sales in 2013 grew 86 percent.

The price of entry-level smartphones has commensurately declined. ARM Holdings, the market leader in providing processors, suggests that by 2015 more than half the smartphone/tablet shipments will comprise entry-level phones at less than $150. Continued scaling on process technology, and development of small and power efficient CPU cores, combined with new competition in low-cost markets, suggests a price floor of $20 in 2015 for an entry level smartphone running Android (ARM). This price is below the prices of feature phones (corrected for inflation) bought in Kenya by the unbanked at the start of the mobile revolution in 2007. The cheapest android smartphone in Kenya in 2014 is under 5000 Kenyan shillings or $55.

According to GSMA Intelligence, Global smartphone adoption is projected to increase 1.7 fold, between 2012 and 2017, with with a 5-fold smartphone penetration expected in Sub-Saharan Africa and a 2.2 fold increase for Latin America (see Almazán and Sitbon, 2014).

Cheaper smartphones and recycled smartphone handsets marketed in developing countries would provide access to sophisticated features and a spectrum of financial services. Inflexible interfaces on basic feature phones for more advanced products, such as accessing account information, switching between accounts and submitting loan applications, might itself prompt the uptake of smartphones. The adoption of smartphones will likely increase the usage of broader financial services.

This contention is supported by evidence in the US (Federal Reserve, 2014). Smartphone adoption substantially contributed to the increased use of mobile payments in the US in 2013 (Section 4.3). In the US, there is a relatively high prevalence of mobile phone and smartphone use amongst younger generations, minorities, and those with low levels of income—groups that are prone to be unbanked or under-banked. And developing countries have predominantly younger and lower income populations.

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50 A smartphone is defined as: “A cellular telephone with built-in applications and Internet access. In addition to digital voice service, modern smartphones provide text messaging, e-mail, Web browsing, still and video cameras, MP3 player and video playback and calling. In addition to their built-in functions, smartphones run myriad free and paid applications, turning the once single-minded cellphone into a mobile personal computer.” [May-14]

51 Data are from Gartner: [http://www.gartner.com/newsroom/id/2665715](http://www.gartner.com/newsroom/id/2665715)

Villasenor (2013) suggests a virtuous circle where greater adoption of smartphones prompts MNOs to offer diverse financial transaction applications for smartphones. Interoperability across networks and between mobile money providers and the banking system will then become easier to implement and to use.

6. The economics of mobile money

The novelty of mobile money and its recent introduction in many countries means few studies\(^{53}\) have examined the economics of mobile money. None has given a comprehensive overview, from both a micro- and a macro-perspective, of the channels through which mobile money might impact on the economy. The macro-consequences are especially poorly understood.

6.1 The micro-view

The mobile money storage and payments system, and its further linkages to micro-insurance, credit and formal interest-paying bank accounts via algorithmic credit scores, could affect household and business outcomes through several different channels. We consider six categories and linkages between the categories.

6.1.1 Reducing transactions costs

Primarily, mobile payments substantially reduce the transactions costs (in cash and time) of sending and of receiving money over sometimes substantial distances, where there are poor and expensive transport links. Being a mobile money customer also reduces the costs of acquiring cash (“cash-out”) if agents are readily available.\(^{54}\) The mobile money “infrastructure” has to be in place and working well to reap the benefits. A poorly monitored agents’ network may be subject to “leakages”. Aker et al. (2014) and Blumenstock et al. (2014) both note that a dearth of agents, through a limited network in Niger, or anxiety in a highly insecure and unsafe environment in Afghanistan, may make it difficult to access cash from agents, raising transactions costs.

What are the types of transactions costs involved? They include the transport costs of travel to a bank, utility company or government office; the time it takes to travel and the time to wait in long queues; coordination costs between individuals, between firms and suppliers or customers, and between government and individuals, which can be extensive in both time and money lost; and costs of “leakage” through corruption or middlemen with insecure methods of transfer (acting like a tax), and at an extreme, the cost of complete loss through theft.

Both the loss of money and loss of time have an opportunity cost: through reduced funds that could have been invested, spent or saved; and through reduced time that could have been spent in productive activities, such as agricultural production or innovation.

Mobile payments, though dominated by person-to-person transfers, have increasingly diversified to cover the payments of bills, utility bills and rent by individuals; payments to suppliers by firms; and payments of salary, pensions and cash transfers to individuals from government or donors. Utility bill payments by individuals and payments of suppliers by businesses can be rapidly and securely executed from afar. With automated delivery of cash transfers, wages and social security

\(^{53}\) The following authors have examined aspects of the economics of mobile money: Mas and Klein (2012), Jack et al. (2010), Jack and Suri (2011) and Weil et al. (2012).

\(^{54}\) Withdrawal of cash from mobile money accounts attracts a transactions fee, but this would be lower relative to transport costs and queueing costs at scarce bank branches, and the costs of maintaining a bank account.
funds, and delivery of private remittances by electronic transfer (rather than by bus drivers), there is also greater certainty of the timing of cash receipts (including that it arrives at all), which helps planning and hence reduces coordination costs and the costs of delays (opportunity costs).

Another example of how transactions costs can be reduced for businesses is by the development of innovative coordinated payment networks, with special consumer incentives for paying and by simply entering the cash till number on their phones. Payment can be done from afar. This is exemplified by Kenya’s “Lipa na M-Pesa” business network.

The combination of mobile money for payments, and the mobile phone to reduce search and information costs and to reduce communication costs (an aspect of coordination), makes for gains in efficiency.

6.1.2 Reducing asymmetric information and improved transparency

Asymmetric information is at the heart of the failure of the formal banking sector to advance credit to reach poor customers with no collateral and no financial histories. Recording financial transactions not only creates greater financial transparency, but it also reduces asymmetric information.

Moving cash from under the mattress into an electronic account turns it into recorded cash. Every deposit or withdrawal, and transfer or payment through mobile money is recorded in the telecoms log for that customer, creating a financial history (and for the unbanked customers, for the first time). Section 3.4 discussed the application of algorithms to create credit scores based on the types, timing, frequency and size of mobile payments transactions, facilitate the granting of credit. Thus, having a record of an individual’s financial history becomes an important indicator of financial inclusion.

Reducing asymmetric information via credit scores from financial transactions histories is not new. This is how the FICO scores in the US, decisive in 90 percent of US lending decisions, are created. In the US, legislation (enacted only in 2004) requires credit reporting agencies to provide extensive credit score information at the customer’s request. This is an issue that will surely have to be addressed by regulators in the future in the context of mobile payments credit scores in cash-dominant economies.

Consumers’ rights are also potentially protected against theft, fraud and misinformation by electronic records of payments and purchases. Again this depends on regulation for consumer rights. This will surely need to be addressed where coordinated business use of payments is growing rapidly, as in Kenya’s “Lipa na M-Pesa”. This type of protection can also reduce transactions costs for consumers and increase use of business through trust. 56 Similarly, Radcliffe and Voorhies (2012) note that the “anonymity of cash” may also damage trust between traders and new vendors if their anonymous cash-based transactions are not backed up with a digital record.

Another aspect of financial record-keeping has important implications for research into the economic effects of mobile money, and in general. This is the use of administrative telecoms to create predictive indicators, say of wealth based on expenditure, in developing country environments with very limited available economic information. To my knowledge, mobile money transactions data have not yet been used in this way, only mobile phone data (see Section 7.3).

55 “FICO” derives from the Fair Isaac Corporation, the firm that began data-driven credit scoring in the 1950s, which scores were endorsed in 1995 by Freddie Mac and Fannie Mae, the US housing finance agencies. By 2000, the FICO scores were used for the origination of 75 percent of US mortgages. By 2015 they are used in 90 percent of lending decisions (Financial Times, 5th February, 2015, page 9).
56 An example in the UK and the US is the huge growth in online distance purchases from Amazon, sometimes internationally, with built-in guarantees and rights of return of faulty products, influenced by consumer reviews of purveyors.
Recorded transfers with appropriate ID documentation ("know your customer") could facilitate some crucially important transactions e.g. international remittance transfers. The closure, for instance, of vital channels of money transfer to Somalia, is referred to in Section 6.2.3. On 5th February 2015, it was announced that Merchants Bank of California, which now handles about 80 percent of official remittances from the US to Somalia, worth about $200m annually\(^57\), was withdrawing its services due to new US money-laundering regulations from the OCC\(^58\), requiring improved information on the sources and destinations of the funds it was wiring. However, if sender and recipient are both members of a mobile money payments network, and identified by more stringent ID requirements for international remittances, this creates a complete record of transfers to registered individuals at each end. The alternative is use of the unregulated black market (see Section 5.4) in cash transfers that could make it easier to channel money to militant groups. There is a huge opportunity for mobile payments with currently only a minute market share, on the international front.

A final aspect of transparency for promoting competition and for protecting consumers should be the required dissemination and posting of information on transactions costs, which can be done on websites and at agent’s stands to help regulate the service. Aker et al. (2014) suggest that cash transfer recipients obtaining their cash from an agent might be exposed to different products (or prices) at the kiosk, and could be encouraged to store some of the transfer on their phone, promoting saving.

### 6.1.3 Increasing saving and changing the nature of saving

There are several motives for saving. There are life-cycle motives which compensate for differences in timing between income and expenditure streams, and include saving for education, leisure, marriage, consumer durables, housing purchases, retirement and funeral expenses. Precautionary motives (buffer stock saving) reflects the uncertainties concerning future income and expenditures, and include saving for unemployment, illness, accidents, natural disasters and risks associated with old age. Finally, there is saving for a bequest motive, to give gifts in one’s lifetime or to leave a legacy to heirs. Saving thus helps to allocate consumption over time and to reduce risk.

For the unbanked poor, their “immersion in physical cash creates considerable frictions in their financial lives” (Radcliffe and Voorhies, 2012). Cash-based households have several informal savings options, which carry risks of theft or “liquidation”: cash under the mattress; accumulation of assets such as jewellery or livestock; and storing savings with informal savings groups. Loss of savings in this manner is common.

The mobile money electronic accounts offer safe storage of cash, though without the payment of interest, and the cash erodes through inflation. The safety aspect should nevertheless increase the level of savings, net of theft and losses, alone (Jack and Suri, 2011).

There are other advantages. One is privacy, noted by many authors e.g. Aker et al. (2014). The inconspicuous nature of transfers could allow personal savings to accumulate, without the user being importuned by needy friends and relatives or giving way to current consumption needs. This has given women more bargaining power, see Section 8.1.4.

Related to this is an economic psychology literature on how the poor could be encouraged to accumulate savings in the mobile money electronic storage accounts (Mas, 2012). Use of “commitment” savings accounts with pre-determined goals or duration have been explored by Ashraf and Yin (2009), see also Dupas and Robinson (2013).

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\(^57\) Total annual remittances to Somalia are estimated at $1.6bn (£1bn). A large section of the population relies on these transfers.

\(^58\) The OCC is the Office of the Comptroller of the Currency, a Treasury Department arm that regulates national banks.
Johnson (2014) has written about the effect of mobile money on rotating credit schemes and stressed the continued importance of such schemes for perpetuating trust and coordination in communities. Practically, these schemes do co-exist with mobile money (see Jack and Suri (2011)); there is some evidence of substitution away from them (Section 8.1.5); but equally, there is evidence that the transfer and storage mechanism is actually exploited by these schemes (Section 8.1.5).

6.1.4 Risk and insurance

The poor are at risk of multiple communal shocks including flooding, droughts, pestilence, other natural disasters, and sometimes conflict and medical epidemics; and idiosyncratic shocks including theft, damage to the homestead, illness and death in the family. There are very limited opportunities for insuring against these risks. Formal insurance is typically absent, but family, clan and network ties can create informal insurance networks, spreading risk by periodic transfers and monitored by trust relationships amongst members of the network (De Weerdt and Dercon 2006). Jack and Suri (2011) suggest several ways by which mobile money can facilitate risk-spreading. The geographic reach of networks can enlarge, though with more limited observability and hence accountability of remote members. They note that timely transfer of sometimes very small amounts of money can arrest serious declines that may be irreversible or hard to reverse. In general, the mobile money technology allows small and more frequent transfers of money that make for a more flexible management of negative shocks. Thus, informal insurance networks may function more effectively. In turn, more efficient investment decisions can be made, improving the risk and return trade-off. Where mobile money develops sufficiently to allow access to micro-insurance for health (Section 3.5), there is an additional buffer against negative shocks.

6.1.5 Changing family dynamics and changing social networks

Mobile money could change relative family bargaining power. It was suggested above that the reduced observability by others of the timing and sizes of mobile transfers, and of the accumulated electronic balances, could protect savings for the recipient. Greater privacy may influence both inter-household allocations (Jakiela and Ozier, 2012) and intra-household allocations (Duflo and Udry, 2004). If the nature of expenditure by gender differs (Chattopadhyay and Duflo, 2004), there could be welfare changes in the household. Indeed, Aker et al. (2014) measure improved household bargaining power for women in Niger receiving cash transfers, with resulting welfare improvements (Section 8.1.4).

Mobile money could also change the nature of social networks in various ways. Generally, the improved communication and coordination in a social network, using mobile phones and instantaneous mobile payments, could improve planning and efficiency. The size of networks could be expanded with the greater geographical reach of the transfer mechanism. According to Chuang and Schechter (2015), there is little research on network formation (or, presumably, dissolution), and on migration and remittance decisions using network data. The reduced transactions costs (especially reduced theft) of remittances might create a more liberal attitude to migration from the homestead. Jack and Suri (2011) suggest that households could invest in family members working far afield to acquire skills and better salaries. The cohesion of the network could be strengthened or weakened. One example of the latter is that mobile money may deleteriously affect existing networks (see Mbiti and Weil (2014), who find evidence for a reduced use of ROSCAs, Section 8.1.5). Raised expectations of larger and more frequent remittances might cause recipients to place pressure on migrant family members. Jack and Suri (2011) suggest that incentives to work or innovate could weaken within recipient households, creating greater dependency. On the other hand, distant migrants
are less observable and accountable. Morawczynski & Pickens (2009) record concerns that husbands which previously delivered money to their rural families, by substituting electronic money transfers, visited home less frequently contributing to the disintegration of marriages.

6.1.6 Improving efficiency

Mobile money facilitates trade, making it easier for people to pay for, and to receive payment for, goods and services. The above has shown that changes wrought by the use of mobile money can lead to better allocation of savings and of labour both within the household and in businesses, and more efficient investment decisions affecting agriculture, business and investment in human capital. The result can be an improvement in returns to investment, and a feed-back to greater savings. The Aker et al. (2014) study gathers a number of facets: the improved bargaining power of women through increasing the privacy of a cash transfer, their preference to spend on the nutrition of children, and improved time saving from lower transactions costs, enabling the additional productivity to pay for expenditures.

The efficiency issue raises the serious question about whether the quality adjustment for Information Communications Technology (ICT) and mobile services in the CPI are sufficient. If not this probably means that inflation is overstated.

6.2 The macro-economic view

The available literature has focussed on the possible inflationary effects from the increased velocity of circulation induced by mobile money. We consider this focus partial and misplaced. It is also often assumed that there is no creation of money from mobile money, but that cash is simply exchanged for electronic money so there is no direct effect on the money supply (e.g. Di Castri (2013), p 10). This is not correct. We consider the potential impact of mobile money on macro-economic aggregates including the money supply, credit, saving and consumption, investment and productivity, and inflation.

6.2.1 Mobile money, credit and transmission to the money supply

There are several channels through which mobile money could potentially affect the money supply. Some will be more relevant in the future as they depend on further innovations in the mobile money technology. One such example is the low-cost linkage of mobile money accounts with bank accounts, and payment of interest on and the extension of credit through these bank accounts (e.g. see M-Shwari in Kenya, see Box 1). A second example is low-cost international transfers to mobile money accounts linked with bank accounts, likely to surge from 2015 (see the Kenyan example, Box 1).

To indicate the evolution in this rapidly transforming area of finance, we consider a statement from (early) economic commentators on the macro- and growth effects of mobile money: “Yet many m-money systems in developing countries are not technically banking from either a financial or legal perspective: (i) they do not provide interest on savings, or (ii) facilitate access to credit from formal financial institutions, nor (iii) do they insure the value stored in the mobile account” (Aker and Mbiti, 2010). This statement is today incorrect and we explain why below, illustrating with East African experiences.

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59 An exception in the literature is Mas and Klein (2012, p6).
60 Our numbering inserted for expositional reasons.
The electronic money accounts do not provide interest to customers. Some commentators have argued that they should (Ehrbeck and Tarazi, 2011). Customers face the same loss on their electronic balances as when holding cash.\(^{61}\) However, innovation has created a path from registered mobile money users via their electronic accounts to formal bank accounts which do pay interest (Kenya’s M-Shwari, Box 1).

Moreover, the commercial banks’ trust or escrow accounts do pay interest.\(^{62}\) Uganda’s regulations\(^{63}\) require the MNO to partner with a bank. Kenyan regulations\(^{64}\) do not require this. However, the function of the partner bank in Uganda’s case is identical to that of the commercial banks housing the assets of the Safaricom Trust (Box 1): they both hold “escrow” accounts. The Ugandan escrow account is defined as: “a bank account held by a licensed institution for and on behalf of the participants in the mobile money service who have deposited cash in exchange for e-money they receive on their mobile wallet”. Mobile money operators cannot themselves intermediate the funds they have mobilized from their customers; they must transfer these funds to a commercial bank which is subject to the prudential regulations applicable to deposit taking institutions. The mobile operator can partner with as many banks as it chooses and each will hold an escrow account. In Kenya, the central bank has required that two Kenyan commercial banks hold these assets of mobile money customers on behalf of the Safaricom Trust.

The escrow deposits can be on-lent and hence there is credit creation. In effect, the mobile money saving in electronic accounts has moved informal cash into the banking system. The transfer of informal cash will not increase the recorded money supply per se unless the source is unrecorded cash, say in another currency. A shift of informal cash into the banking sector has a zero first round effect on the money supply. But creation of credit from the escrow accounts does increase M3. The question is what proportion of the escrow accounts can be sustainably on-lent given that these electronic “savings” fluctuate in the absence of incentives (e.g. interest) to be held longer-term. As the system grows, with the possibility that savings incentives in electronic accounts may develop, the escrow balances could become significant and more stable. Because banks can lend on in a second and further rounds, there is a money multiplier which can expand the money stock. The crucial question is what exactly are the regulations that govern the on-lending of escrow accounts? Presumably these differ by country and may also change over time. The money multiplier will surely be less than for the direct deposit of informal cash in the banking system since for an escrow account to be safeguarded, there must be limits on the degree of extra risk the bank can take on given an expansion of its balance sheet of this type. Moreover, if informal cash can safely be attracted into bank accounts from informal savings (i.e. facilitated by specific mobile money linkages with low transactions costs e.g. M-Shwari), there is the potential for increased saving (and decreased consumption). This money would no longer have a counterpart in the escrow account, but would, through being on-lent as a conventional bank deposit, expand the money supply.

Some markets have evolved so that Aker and Mbiti’s second point is also no longer true. Small loans backed by credit ratings can now be accessed through mobile money (e.g. in Kenya, Box 1). Typically these amounts for individuals are tiny (Section 3), commensurate with limited

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\(^{61}\) This can be considerable if inflation is high, but there are no charges for holding the electronic accounts compared with sizeable costs for bank current accounts.

\(^{62}\) In the case of Kenya’s Safaricom this interest is paid to charity, though in theory they could use it to reduce transactions costs for customers or to pay them interest.

\(^{63}\) New Bank of Uganda regulations: [https://www.bou.or.ug/bou/media/statements/Mobile_Money_Guidelines_2013.html](https://www.bou.or.ug/bou/media/statements/Mobile_Money_Guidelines_2013.html).

\(^{64}\) Since October, 2007, formal regulation has been light, see Section 12, and prior to this, was based on letters of “no-objection” from the Bank of Kenya. New Kenyan regulations: [http://www.gsma.com/mobilefordevelopment/kenyas-new-regulatory-framework-for-e-money-issuers](http://www.gsma.com/mobilefordevelopment/kenyas-new-regulatory-framework-for-e-money-issuers).
information in the credit scores. With time, as credit scores improve, they could evolve in aggregate to a sizeable sum. Generally, the credit channel for individuals is unlikely to be a major force in the medium-run given the lack of collateral of the most likely users of the new bank accounts linked to electronic accounts. But potentially credit for small businesses could be extended through such accounts (e.g. when credit scoring and other methods are introduced to try to ease credit constraints on small business), expanding the money supply.

Aker and Mbiti’s third point is also not correct as regulatory guidelines have firmed. The electronic accounts carry no conventional deposit insurance as for a bank account. The legal position is that, if available, the conventional deposit insurance for the escrow account of pooled customers’ funds accrues to the customers. The insurance level is typically low (of the order of US$1000). However, if mobile money accounts are small they should mostly be covered, provided that regulation allows pass-through protection for each customer up to the insurance limit (as in the US), as opposed to one insurance payout applying to the account as a whole (Section 10.2).

All the above funds come from deposits made domestically by users and agents. But extra liquidity will be added by the mobile money operating company for fluid functioning. The operator can borrow domestically for this top-up, can use its own domestic holdings or import money from abroad if they are a subsidiary.

A far more immediately important channel to the money supply will be from a surge in recorded remittances through mobile money channels. Regular foreign remittances if rechanneled through more cost effective and convenient mobile money accounts, will not affect the money supply insofar as they are already recorded through official channels. But if the ease and lower cost of transfer enhances the flow of foreign remittances, this is potentially a channel to increase the money supply. And, if previously unrecorded foreign remittances flows are rechanneled through mobile money, the recorded money supply will increase. In some countries, black/grey/illegal markets are sizeable (e.g. Somalia). We discuss the potential for a vast increase in international remittances through mobile money in Section 9.13.

Putting the above effects into current context, several surveys have noted that the amounts involved in the M-Pesa network in Kenya are currently far less than in the official banking network. This, too, could alter. In Uganda, as of June 2014, there was a total of Shs171 billion held on the mobile money accounts of customers of the six mobile money operators in Uganda, some 1.4 percent of the total deposits in the banking system; and mobile money transactions constituted less than a tenth of all the financial transactions in the financial system (Tumusiime-Mutebile, 2014, page 4).

6.2.2 Mobile money, saving, “spendability” and inflation – why the concept of velocity is misleading

A potentially important channel of transmission of innovations in mobile money to inflation is via the impact on the private sector saving rate. A reduction in the private sector saving rate implies a rise in expenditure relative to income i.e. in the demand for goods and services relative to supply, to the extent that income is closely linked to supply. The first-round impact of such an increase would be inflationary. Such a reduction in the private saving rate could come about from a reduction in the incidence of perceived credit constraints, which could result in a reduction in precautionary saving. To the extent that lower costs of transmission of cash from relatives or other support networks facilitates the coping of households with negative shocks such as from ill-health or harvest failures, they should be better able to maintain expenditure in the face of such shocks (e.g. see the 2013 Uganda Finscope survey for evidence on such shocks, Appendix Table A1). More generally, if mobile money transfers involve transfers from entities with lower marginal propensities to spend to entities with higher marginal propensities to spend, a reduction in the saving rate would be likely. Whether this is in fact the case is not obvious.
As against the possibility of reduced precautionary saving, there is the possibility that saving for return motives might be enhanced by the development of mobile money accounts both because of the greater security of electronic saving compared with keeping cash under the mattress and from the spread of interest-bearing accounts (e.g. M-Shwari) linked to mobile money savings.

We have used the term ‘first-round’ impact of variations in the desire to save because, as noted above, shifting cash out of the informal sector into the banking system could generate additional credit through the money multiplier and this credit could result in higher expenditure. Paradoxically therefore, an increased overall (net) desire to save, which results in a first-round reduction in excess demand for goods and services, could, through the second-round effects via the money multiplier, result in an increase in excess demand, depending on economic circumstances such as bank regulation, risk appetite and alternative returns available to banks in the T-bill market. Monetary and regulatory policy interventions clearly have an impact on such second-round effects. There are also potential ‘third-round’ effects: if increased credit provision goes into productive investment, the subsequent expansion of supply would be anti-inflationary, though the timing of such supply expansion depends on the investment horizon.

This complex view of the potential linkages between mobile money and inflation can be contrasted with the monetarist view. The monetarist concern with the velocity of circulation and inflation is as follows: if transactions costs are lowered by the spread of mobile money, so that the ratio of transactions volume to money stock rises, then excess demand for good and service rises with greater transactions convenience, given the money stock.

Implicitly the monetarist view regards the money stock as the main constraint on expenditure. At the level of the household this is absurd: expenditure is constrained by income, income expectations, the household’s portfolio of assets and debt and its access to credit. The situation is analogous for firms, but substituting cash flow and expected profits for income and expected income, and recognising the greater relevance of investment spending and access to borrowing. Further, the money stock held by the private sector is a choice, though also influenced by the ability of banks to extend credit and the potential demand by the private sector for such credit. For many households and firms, particularly those with the biggest weight in aggregate spending, the part of the money stock connected with regular transactions is purely a choice variable. Hence, lower transactions costs will mainly result in a reduction in the transactions component of the demand for money and less of that type of money being held.

This is not to say, however, that the composition of portfolios held by households is irrelevant. A higher fraction held in cash or mobile money form should, other things being equal result in wealth being more ‘spendable’. Aron and Muellbauer (2013) and Aron et al. (2012) find that in several industrial countries and South Africa, net liquid assets of households (deposits minus debt) are about five times as spendable as illiquid financial assets (including stock market and pension wealth), and that the “spendability” of housing wealth is highly dependent on credit availability.

Thus, the advent of mobile money, as well as influencing the saving rate, potentially increases the “spendability” of money, with e-money more “spendable” than conventional cash through reduced transactions costs and the greater personal security of not carrying cash. As noted above the concept of velocity is quite misleading, especially in more developed countries with an array of possible alternative assets to money that might fuel demand, and because velocity is unstable. Financial innovation (especially credit liberalization) can have marked effects on consumption and inflation with little connection with the transactions demand for money. The money stock and with it the concept of velocity in fuelling demand is arguably more relevant in countries with few alternative assets.

The inflation fears based on the rapid spread of mobile banking in Kenya seem to be mainly linked to the African Development Bank (ADB) Economic Brief of February 2012. This Economic
Brief should be treated cautiously from a policy perspective. It reflects some of the confusions in the literature on the effects of variations in the money stock on inflation, while other linkages between mobile money and inflation are not discussed in this brief.

The ‘monetarist’ notion that a demand for money function (derived from an extended version of the Quantity Theory identity) which links demand for money with inflation can be reversed to give an inflation equation has long been discredited (Hendry, 1985), and lacks micro-foundations as explained above. The micro-economics of price setting should give a role to both demand side and supply side factors, and to expectations, whether based on auction markets, competitive markets, oligopoly or administrative price setting. The link between money growth and hyper-inflation, made by the famous work by Cagan (1956), essentially arises through fiscal stimulus, when large, expansionary fiscal deficits, financed by printing money, drive demand for goods and services. Constraints on supply (and hence government revenue) usually precede the resort to the printing press, and the disruption caused by hyper-inflation further contracts supply of good and services. Another link between money growth and inflation can arise because, as noted above, liquid assets are the most spendable part of private sector wealth. But better would be to control in the model, where data exist, for the full portfolio of private sector assets and debt and income, taking account of different propensities to spend out of different components to proxy private sector demand. A third linkage can arise when money growth is correlated with the expansion of credit supply to firms or households, resulting in greater private sector spending. None of these channels is likely to generate a time-invariant link (i.e. a stable relationship) between money growth and inflation, however. In other words, one needs a better specified inflation model.

The Policy Brief also ignores the possible countervailing forces. First of all, the spread of mobile banking is likely to lead to significant productivity gains, for example, in agriculture as noted in KEU (2010). If supply of goods expands with demand, there need not be inflationary implications. Second, there could well be improvements in competition in markets for goods and services with falling transactions costs, so reducing the pricing power of price setters. Third, increased household saving is also likely with greater security and interest payments, for instance in the M-Shwari accounts in Kenya, which could take pressure off inflation as discussed above. Fourthly, the weight of ICT in the consumer price index should have increased, while prices of ICT, particularly if quality-corrected, continue to decline. It is far from obvious therefore, that well-measured inflation should have risen as a result of the spread of mobile banking.

6.2.3 Mobile money, international remittances and inflation

The future size of foreign remittances, regular or informal, re-channelled through mobile money, could be large. The impact on inflation is again an uncertain matter: the remittances could fuel immediate consumption, they could be saved as above, or they could be channelled into productive investments. Furthermore, if inflows of foreign remittances do increase, there could also be offsetting effects on inflation via the exchange rate appreciation they are liable to induce.

Annual remittances exceeded the foreign exchange reserves in 14 developing countries in 2013, and measured at least half the reserves in over 26 developing countries (World Bank, 2013). If the balance of payments weakens, the importance of remittances as a source of foreign currency

There is micro-evidence from Demombynes and Thegeya (2012) that household saving has risen as the result of the expansion of mobile banking.

This sub-section draws on the World Bank’s Migration Briefs and databases, and the World Bank’s Remittance Prices Worldwide database (see Appendix Table A1).

The World Bank’s African Migration project provides information on leveraging remittances for development.
earnings increases. Officially recorded remittance flows to developing countries reached $414 billion in 2013, up 6.3 percent from 2012. Global flows reached $550 billion in 2013. Projections for 2016, using an 8 percent annual growth rate, are that remittances to developing countries could reach $540 billion, and, worldwide, over $700 billion. The true size of remittances, including unrecorded flows, is likely to be significantly larger. Remittances reported by commercial banks in Sub-Saharan Africa do not fully capture flows through money transfer operators, post offices, and mobile money transfer operators, and illicit transfers. Kendall et al. (2013) note that two-thirds of remittance recipients in South Asia and Indonesia report using informal channels to make transfers.

The G20’s objective was to reduce the costs of international remittances to 5 percent by 2014 (World Bank, 2014). The prohibitive and non-transparent costs were discussed in Section 3.6, and World Bank price data are shown in Table 1. There is a significant opportunity for mobile money operators to enter this market where currently they have a tiny global share, especially in Latin America. If the cost and ease of making remittances improved, this could attract a higher level of official remittances, and re-channel “informal” or illicit remittances through official channels, raising recorded remittances. This could also improve official statistics and potentially the economic management of remittances.

Already, competition from internet-based remittance service providers has spurred Western Union from 2012 to develop online and mobile applications, cutting costs of remittances, and to forge stronger ties with banks to offer its money-transfer services to their customers through their online-banking websites. Exclusivity agreements between money transfer companies and banks are common. Ghana and Nigeria have banned these agreements; in Latin America, competition has risen through the reduction of exclusivity contracts. New Kenyan M-Pesa mobile money links with Western Union are discussed in Box 1.

Regulation is also promoting structural change in the remittances market. Compliance regulations to prevent money laundering and terrorist financing ("Know Your Customer" rules, the Patriot Act, and the Financial Action Task Force (FATF) recommendations) have raised remittance costs since 2001, but should eventually favour money transfer operators with transparent procedures. In 2012-13, there were account closures of money transfer operators by correspondent banks, notably involving flows from the US and the UK to Somalia. This would initially increase remittance flows

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68 These data use the new definition of remittances introduced in the Sixth Edition of the IMF Balance of Payments and International Investment Position Manual, which supplements “compensation of employees” and “personal transfers” with a third item: “capital transfers between households”, though data for the last are difficult to obtain and missing for almost all countries.

69 For developing countries, East Asian and South Asian flows ($115 and $114 billion, respectively) far exceed those to Latin America/Caribbean ($61 billion) and Sub-Saharan Africa ($32 million). The highest recipients of officially recorded remittances for 2013 were India ($71 billion), China ($60 billion), the Philippines ($26 billion), Mexico ($22 billion), Nigeria ($21 billion), and Egypt ($20 billion). Other large recipients include Pakistan, Bangladesh, Vietnam, and Ukraine. As a percentage of GDP, the top recipients of remittances in 2012 were Tajikistan (48 percent), Kyrgyz Republic (31 percent), Lesotho and Nepal (25 percent each), and Moldova (24 percent). Nigeria accounts for more than half of total remittances in Africa. However, as a share of GDP, the largest recipients are Lesotho, Togo, Cape Verde, Senegal and The Gambia.


71 The average fee to remit money in Africa is the highest of any region in the world, see Watkins and Quattri (2014) (ODI).

72 The Financial Action Task Force (FATF) is an inter-governmental body established in 1989 to “set standards and promote effective implementation of legal, regulatory and operational measures for combating money laundering, terrorist financing and other related threats to the integrity of the international financial system” (http://www.fatf-gafi.org). The FATF currently comprises 34 member jurisdictions and 2 regional organisations.
via informal channels worsening the quality of remittance data. The World Bank emphasises the need to explore alternative service providers (World Bank, 2013). Refraining from taxing remittance outflows and avoiding exclusive contracts with money transfer operators will be important.

7. Data measurement issues concerning mobile money

Mobile money is expanding fast internationally and within countries. Its current importance in domestic (and potentially, international) electronic transfers and safe storage of cash, its potential to further enhance financial inclusion via prudentially-regulated financial institutions, and its likely further growth with enabling regulation and competition policy and with adoption of smartphones with associated software and applications innovations, suggests there are many empirical economic questions to explore. Apart from micro- and macro-focused empirical research, central banks need to track mobile growth appropriately for their inflation models and prudential analyses. Country regulators of the ICT industry need to monitor trends.

A vast amount of data is continuously recorded by the mobile money operators from the number and value of different types of transactions flows, the balance stocks of individuals, businesses, donors and governments, and the numbers of active customers by type. If there are strict rules of nondisclosure and privacy it may not always be possible for researchers to obtain these data; but central banks and regulators could access them. These data could be aggregated in various ways. If anonymising procedures could be accepted by mobile money operators, then the benefits from research analysis using anonymised disaggregated data could be reaped.

7.1 Global data coverage

First, it is of interest to track global statistics extant, for the geographical spread, profitability, use and supply of mobile money. We summarise sources for macro- and micro-data for mobile money available on the internet. Some are freely downloadable; others require subscription. Appendix Table A1 comprehensively summarises organisational websites (with links) pertaining to mobile money and financial inclusion, and describes their data provision and coverage.

7.2 Administrative transactional data and survey micro-data

At the disaggregated or micro-level, myriad research questions arise. What influences the adoption of mobile money and the adoption of related mobile money financial services on the pathway to financial inclusion (e.g. international remittances, savings accounts, credit and insurance)? Does access to remittances through mobile money improve welfare, for instance as measured by consumption? Does access to increased and diverse mobile money remittances improve informal insurance against shocks and spread risk? What is the impact of savings accounts and access to remittances on women’s bargaining power and productivity? What factors determine how people save in such savings accounts and in electronic accounts? How are existing social networks affected by mobile money? What impact has mobile money had on internal migration in the jobs markets?

To study questions such as these, and others, reliable and accurate data at the individual-level, household-level, village-level, and the firm-level, are needed. Aker and Mbiti (2010) suggest partnering with organisations to evaluate new interventions with experimental or non-experimental techniques. There is already a small industry burgeoning in the collection of internationally-comparable usage and quality data, and country-focused micro-data sets, see Appendix Table A1. Several studies combine ongoing household expenditure surveys with data from mobile money providers, and some surveys already incorporate questions on usage of mobile money services.
Researchers have collected data themselves through surveys and interviews (e.g. the household survey and M-Pesa agents’ surveys by Jack and Suri (2014)). However, surveys are subject to withholding or mis-reporting (exaggerating, under-stating, misremembering) of data, introducing measurement error.

Some excitement is being generated by the sheer volume of recorded transactions in so many countries by many operators. In a survey on social networks, Chuang and Schechter (2015) refer to the high-frequency administrative data used for Rwanda by Blumenstock et al. (2014), see Section 8.1.3 suggesting: “this is just the tip of the iceberg in terms of what can be done with such data.” Self-reported network assessment tends to be rife with measurement error, see survey by Chuang and Schechter (2014). Administrative data on mobile money monetary flows has the benefit that the timing and size of flows reduces measurement error. Chuang and Schechter (2015) indicate new possibilities for examining how mobile money is used in and how it affects existing networks such as group-based ROSCAs. Administrative data can be combined with field interview data, as in Blumenstock and Eagle (2012), who analyse disparities in mobile phone access and use in Rwanda (Section 4.3).

Administrative data can also effectively be exploited to create data that could be used in research analyses and in practice by financial institutions. We have referred to the use of algorithms based on histories of transactional data to create credit ratings where such information is otherwise absent (Section 3.3). Innovative work by Blumenstock (2014), using survey data and terabytes of transaction-level call histories obtained from the mobile telecoms operator, finds that mobile phone records can predict welfare indicators such as the socioeconomic status and asset ownership of individual mobile phone subscribers (that otherwise rely on self-reported data). Such data could also be used to cross-check self-reported data. Moreover, this approach appears not yet to have exploited mobile money transactions data, which could give far more detailed information about asset ownership and expenditure (see examples in Section 3). Administrative telecoms data also allow derivation of social network structures via the cross-calls. Geotagged data generated by mobile phones can derive a proxy for internal migration patterns (Blumenstock, 2012), which is potentially relevant for work on remittances.

However, for the unwary, there are problems with the definitions of dependent variables based on telecoms data (see Aker and Mbiti (2010)). Adoption studies want to capture the individuals who actively use mobile phones. The proxy used is typically the number of mobile subscriptions or numbers owning a mobile phone. But if individuals own multiple, valid SIM cards with different providers, or if there are inactive accounts, this will this will exaggerate users. If significant numbers of users are unregistered (e.g. who share a neighbour’s phone but do not own a phone themselves), this will under-estimate usage. The precision of the variable is compromised, introducing measurement bias into a regression.

There are analogous difficulties in measuring precisely the number of active mobile money adopters. Using the number of mobile money accounts or the number of registered customers may induce multiple (over) counting of the same individual if several accounts are held with different providers to take account of differing incentives. If registered customers are inactive, and globally two thirds of registered accounts are inactive with a generous 90 day definition, this will exaggerate the participation (see Figure 4). On the other hand, there is undercounting of overall usage where unregistered customers intensively use the service, as in South Asia.

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73 Examples are ownership of assets such as radios and televisions; and characteristics such as access to plumbing and electricity.

74 The FinAccess surveys for Kenya (2006, 2009), see Appendix Table A1, finds a third of Kenyans shared their mobile phones with friends or relatives.

75 The number of unregistered mobile money users seems to be growing at an annualized growth rate of 102 percent, see Section 5.1.
Some data are simply absent. Misspecifications in regressions are exacerbated by omitting unmeasurable variables linked to mobile phones and mobile money, such as spill-over effects in the community and technological and quality changes (making phones cheaper, more capable and easier to use).

7.3 Aggregate data for macro-analyses

We consider the types of data central banks collect to monitor the possible economic impact and prudential risk of mobile banking and payments. We consider what it may be useful to add to the database, especially for tracking expenditure. We consider what such data show about correctly measuring the consumer price index (CPI).

We use the data collected by the Bank of Uganda as an illustration. The Bank of Uganda collects aggregate monthly data by telecoms provider (MTN, Airtel, UTL, (formerly Warid, now merged with Airtel), Orange, Mcash, and Ezeey Money) on: the number of transactions; the value of transactions (Shs); the number of registered customers; the value of outstanding remittances (Shs)\(^76\); the money balance on customers’ accounts (Shs); and the number of agents. These data are illustrated in country totals relative to deflators in Figure 5.

On the prudential risk, the relative size of the mobile money system is small when contrasted with the overall size of the money sector (see details for Uganda and Kenya in Section 6.2.1). As East Africa, especially Kenya, is a growth region for mobile money, these figures provide an approximate upper bound for developing and emerging economies. There is a 100 percent escrow account backing for mobile money electronic funds in prudentially-regulated banks, with daily required matching of the accounts in Uganda and Kenya (Section 10 and Box 1). With further growth of domestic payments, the daily checks in place allow constant monitoring by the central banks; notably many transfers are substitutes away from existing banking business to mobile payments.

On monitoring the growth of credit: the creation of credit through mobile money-linked loan accounts is at an early stage; it has developed to a small degree in Kenya, where small amounts are lent for a brief period. If there was a sharp increase in such credit extension, the impact could be separately monitored using segmented data on such mobile money loan accounts. However, monetary authorities routinely draw such information from bank balance sheets. Of more concern is monitoring the forthcoming predicted surge in international remittances via mobile money (Sections 3.6, 5.4, 6.2.3 and Box 1). If informal remittances are re-channelled through formal channels, and if formal remittances further increase because of secure, lower cost, instantaneous, convenient methods of remit, then there could be effects on the size of the money supply and on the exchange rate. Monitoring growth of the segment of international remittance transfers via mobile money is then important.

On the inflationary impact, in Aron, Muellbauer and Sebudde (2015), Ugandan inflation forecasting models are built and tested with measures of mobile money to assess the possible impact of inflation. The two indicators used are the total value of transactions relative to M3 and money balance on customers’ accounts relative to M3\(^77\). The value of transactions measure is a monthly flow of all transactions that may include individuals transacting with different operators. The money balance on customers’ accounts at the end of the month is a stock which is part precautionary or

\(^76\) These are funds that have been remitted through the system, but not yet delivered to recipients (funds in transit to final recipients).

\(^77\) We avoided imprecise measures such as the number of registered customers since individuals could have a registered SIM card with several providers, or be inactive. Such a variable would be a rising trend, as would the number of agents (also with uncertain activity), but without clear economic content. The number of transactions is not weighted by size of transaction and is not meaningful either.
buffer stock saving and part transactional saving. The empirical evidence is that there are no inflationary implications of either measure of mobile money.

In principle, a more detailed understanding of the effects on expenditure and social trends in financial inclusion could be achieved by collecting aggregates of the underlying data from the mobile money operators. This could be useful in “now-casting” for the central bank to get a more contemporaneous view of economic activity when the national accounts are slow to appear.

The number of transactions could be disaggregated by donor, government, business and individuals; individuals’ transactions could be further disaggregated by gender and age. The number of agents could be distinguished by being active or non-active; and by region and municipality. The number of customers could be distinguished by donor, government, business and individuals (also gender, age, location and “income group”78); but also as active or non-active. Here there may be multiple-counting, unless customers are coalesced across providers by the ID they present. The value of transactions could be disaggregated by types of transaction: private transfers, retail payments to business, business payments to suppliers, payments of wages by business or government, social security payments by governments, cash transfer by donors, payments for goods, payments for services, payments for transport, payments for taxes or fines, payment of school fees, payments for insurance (including funeral insurance) and payments of utility bills. The money balance on customers’ accounts could be disaggregated in the same way as the number of customers.

On the measurement of inflation: the weight of ICT in the consumer price index should have increased, while prices of ICT, particularly if quality-corrected, continue to decline. The CPI will also overstate inflation by not taking into account time cost savings. It is difficult to measure the quality of services as hedonic methods are not often appropriate; this is an issue in the UK too79. It is far from obvious therefore, that well-measured inflation should have risen as a result of the spread of mobile banking.

The much-discussed increase in transactions velocity (i.e. value of transactions per unit of money held), see the ADB brief referred to above, has led to attempts to calculate the transactions velocity of M-Pesa, given a number of underlying assumptions. However, Mbiti and Weil (2013) for August, 2008, and Weil et al. (2012) updating for July 2007 to April 2010, reach opposite conclusions on the prevalence of the role of mobile money as a payment medium versus a store of value. However, note that velocity will be time-varying as mobile money usage spreads from the wealthy segment down to the poorer segments: velocity will change as the composition of the marginal household changes, thus may increase at the start and decrease towards the end of the sample. It is thus necessary to distinguish between the spread over customers and variations over time for existing customers, and these are difficult to disentangle. The above studies do not correct for this. Moreover, as pointed out in Section 6.2, there is unlikely to be a significant causal link between velocity and inflation.

7.4 Qualitative institutional data: addressing the gap for empirical work

Many studies of adoption, for example, fail to control for the often-important regulatory determinants and regime changes (see Section 8.1.2). Given the prevalence of mobile payments usage in business (see Box 1), the World Bank’s Doing Business website could add a category for how comparatively easy it is to register for mobile money. This type of institutional data is used in cross-country economic studies (see examples and a critique in Aron (2000)). Moreover, documentation of

78 Income group could be deduced by average bands of transactions sizes or a threshold for money balances held.
important regime changes that could affect the uptake of mobile money is required for all models that include mobile money data (e.g., see the Côte d’Ivoire example in Section 8.1.2). Regime changes can be entered as step dummies and can be crossed with other variables to see whether the behaviour of the variable is affected by the regime change, thus exhibiting non-linearities.

8. Empirical evidence on the economics of mobile money – selected studies’ findings.

Mobile money is a novel phenomenon. There are qualitative studies, but fewer quantitative studies, assessing the impact on economic outcomes. Economic modelling difficulties imply that the conclusions drawn are often suggestive only. Since institutional structures, regulation and demand patterns differ across countries, generalisations of evidence need to be made cautiously. We survey the empirical literature linking economic outcomes to mobile money. The bulk of empirical work on the economic impact of mobile money has employed survey data at the household or firm level. A few macro-studies are examined too.

8.1 Micro-literature

“Perhaps the ‘holy grail’ of demand side data is the impact question. How can we understand whether branchless banking services are making a positive difference in client’s lives?”

The two main empirical approaches employed in this literature to assess the impact of an intervention such as the introduction of mobile money are critically contrasted in Section 10.11. Then empirical work is considered by four groupings: adoption studies; private mobile money transfers; public, donor or employer mobile money transfers; and savings behaviour. A typology table summarises the studies and their conclusions (Table 2).

8.1.1 RCT versus differences-in-differences approaches

To explore the factors that determine the adoption of mobile money (where a proxy for use or adoption of mobile money is the dependent variable), probit or tobit regressions or OLS are commonly used. The main empirical problem is identification of causality. This is discussed below in Section 8.1.2.

There are two main ways to explore the effects of mobile money on micro-economic outcomes (i.e. where usage of mobile money is not the dependent variable). The first approach is to test specific theoretical hypotheses using various regression methodologies on panel or cross-sectional survey data for households or firms, appropriately sampled to avoid selection bias, and comparing control groups with the groups utilising mobile money. Differences-in-differences (DD) estimation consists of identifying a random intervention (such as the “random” roll-out of mobile money, see Section 8.1.2) and comparing the difference in outcomes before and after the intervention, for an unaffected control group as against the same difference for groups affected by the intervention. The estimates typically derive from an Ordinary Least Squares (OLS) regression for repeated cross sections (or a panel) of data on individuals in affected and control groups for one or more periods before and after an intervention. Time and location dummies are included as well as a dummy for the intervention, and a set of other control variables. The restrictive assumption is made that in the absence of the intervention, outcomes for the two groups would have been identical. The method has

80 From McKay and Kendall (2013).
the appeal of simplicity, and when the interventions are approximately random, conditional on time and group fixed effects, it can avoid the endogeneity problems from comparing heterogeneous individuals. Problems arise when the intervention is not random, when the linear assumption under OLS is inappropriate, and from serial correlation problems exaggerating levels of significance in standard errors when several years of data are involved (Bertrand et al., 2004). In the mobile money literature, the introduction of mobile money is often not random but affected by observable factors correlated with its use, such as urban dwelling, wealth and the use of banking services, and unobservable factors such as communal spill-over effects. Finding credible exogenous instruments is a challenge, raising questions about the direction of causality.

The second approach is the use of randomised controlled trials (RCT), common in medical research, and little used in economics before 2003\(^1\). RCT evaluates whether a specific, controlled change has a discernible impact relative to a control group. Proponents argue that RCT is a reliable means of assessing micro-level impact because the randomness of the selection corrects for selection bias; moreover, RCT does not necessarily test one particular economic theory but potentially can reformulate and test other hypothesis to explain a surprising research result. The detractors (who include Deaton (2009), Ravaillion (2009) and Rodrik (2009)) argue that RCTs are of limited value. RCTs focus on very small interventions that apply in certain contexts so that inferences for other settings, or even scaling up based on the results, may be invalid. Identifying a causal connection in one situation might be specific to that trial and not a general principle; replication in different contexts leads to a variety of different results, see also Cartwright (2010). Deaton argues\(^2\) that there are actually two stages of selection. In the first, researchers choose a group from the entire population that will in the second stage be randomly divided into the study and control groups. The first stage is not random, but may be determined by convenience or politics, and therefore may not be representative of the entire population. Further, the studied populations in RCTs are very small, so that an outlier in the experimental group can have a huge distortionary effect. Another factor is that the trial or intervention itself can affect behaviour (as in the Hawthorne 1930 studies on productivity, Gillespie (1991)). Deaton argues: “scholars should take “the halo off the RCT” and subject them to the same critical scrutiny as other methods of evaluation”\(^3\)

8.1.2 Adoption studies

Adoption factors for mobile money differ between developing and more advanced countries. This is driven by institutional differences including financial literacy, inequality and income dispersion, by available alternative payments methods, by the sizes of transactions, and by security concerns, amongst other factors. In the US, the 2013 adoption factors are tracked for mobile payments and banking by income and age cohort of the population, differentiating the banked from the unbanked and under-banked, and considering immigrant communities (Federal Reserve, 2014). The patterns and correlations are likely representative of other advanced economies, and differ from those of developing countries (see Section 4.3).

Several academic studies have tried to analyse the causal factors behind adoption in particular countries. Early studies examined the adoption of mobile phones; there are few studies on the adoption of mobile money. The imprecision of the proxy for the dependent variable can introduce measurement error into a regression (see Section 7.3). There are further difficulties in disentangling

\(^1\) The Abdul Latif Jameel Poverty Action Lab, established in 2003, coordinates a global network of researchers using randomized evaluations to answer policy questions in the fight against poverty. http://www.povertyactionlab.org/

\(^2\) http://www.nyudri.org/events/annual-conference-2012-debates-in-development/

\(^3\) See debate on http://www.nyudri.org/initiatives/deaton-v-banerjee/
the adoption of mobile phones per se from the adoption of the electronic payments technology. In general, such studies are hamstrung by poor quality and limited data. Errors are exacerbated by biases in coefficients from misspecifications, such as omitting key controls from the set of regressors, including difficult-to-measure unobservable determinants. Such unmeasurable factors include spill-over effects in the community, and technological and quality changes (making phones cheaper, more capable and easier to use), see Aker and Mbiti (2010).

Moreover, structural breaks may be crucial in adoption empirics and should be tested for in models using dummies and cross-dummy effects (which introduce non-linearities into models). For instance, in Côte d'Ivoire the cessation of conflict and onset of economic growth and stability from 2012 was the key external event driving mobile money adoption.

There may be many other types of omitted variable too. The variety and quality of services offered seems to have affected uptake in Côte d'Ivoire. Partnership with utilities, the availability of ATMs that could be used without a mobile money agent and the quality and availability of agents all affect active adoption (see Pénicaud and Katakam, 2014, p15). So do advertising and incentives to customers and agents. For instance, if the dependent variable is registration for a mobile money account that is actively used, an important adoption driver to control for might be whether customers transact at registration (incentives for agents to “make adoption stick” are discussed in Section 9.3). However, it is difficult to capture “quality”, and the effects of incentives and advertising campaigns as regressors. The regulatory framework, and how onerous the requirements are at registration, may also have an influence. For instance, a multi-tiered approach to aspects of regulation can enhance adoption by allowing more liberal registration requirements for low volume users until they cross a threshold of use. We suggest in Section 7.4 that qualitative comparative data could be compiled and in principle used in regressions as qualitative indices.

Cognisant of some of the above difficulties, Aker and Mbiti (2010) restrict themselves to examining adoption *correlations* using firm surveys and household surveys, see Section 4.3. But other causal studies appear to confirm their findings. Weil et al. (2012) use the same FinAccess Data from Kenya (2006 and 2009) and add Finscope data from later adopters Tanzania and Uganda (2006 and 2009). They are not explicit on how their dependent variable is measured; they appear to regress a zero-1 dummy: “whether an individual uses mobile money (sends or receives)” on individual characteristics, using OLS and robust standard errors. They highlight the sharing norms so that access to phones is larger than ownership, and for this reason the dependent variable seems apt. Their regressors are: dummies for urban, for poor, three different age cohorts, three different education levels, marriage, gender. They deduce for all three countries (though with limited significance in the less well-developed markets of Tanzania and Uganda by 2009) that adopters of mobile money are more likely to be younger, wealthier, better educated and to reside in urban areas. When the dependent variable is the frequency of mobile money transactions per user in Kenya, they have similar findings. They could not find gender differences (though included). However, their work suffers from omission of other controls (a control for whether these individuals were “banked”) and unobservable controls, see above. The results should thus be regarded as suggestive only and of finding correlations, as in the earlier 2010 study.

Another study to find the drivers of adoption in Uganda is by Munyegera and Matsumoto (2014). They analyse a balanced panel of 838 households generated from the third and fourth rounds of household and community surveys collected in Uganda in 2009 and 2012 as a part of the Research on Poverty, Environment and Agricultural Technology (RePEAT) project. They take two approaches, using a Probit regression and also a linear probability model additionally with household fixed effects (to rule out the effect of unobservable time-invariant household and village characteristics), and find similar results. The dependent variable is a dummy variable which is 1 if household i living in village j in district d uses mobile money services at time period t and 0 otherwise. The regressions differ from
Weil et al (2012) in controlling for ownership of a mobile phone and whether the household has a
migrant worker (captured by dummies), as well as the district × year dummies for fixed effects. The
similar regressors capture age (using a different measure of age as opposed to cohort), gender and
education (using a different measure using years of schooling). Their new regressors capture distance
to the nearest mobile money agent (capturing relative remoteness), size of household and the effects
of wealth in the form of land size and total assets. They do not explicitly differentiate between urban
and rural (but the survey areas are predominantly rural, and any differences should be picked up by
the fixed effects) and poorer families (though wealth is included), which Weil et al. (2012) find
significant, nor whether these individuals were “banked”. Like Weil et al. (2012), and qualitative
work (Section 4.4.3), they cannot find a gender effect; unlike Weil et al. they do not find an age effect
(though a more differentiated cohort measure might be more successful). However, the distance to the
agent is important as is wealth.84 Both the dummies for the ownership of the phone and the migrant
worker are significant. For the same reasons as in Weil et al. (2012), the results should thus be
regarded as suggestive only and of finding interesting and sensible economic and social correlations.

8.1.3 Private mobile money transfers

We discuss two papers that explore the impact of private mobile money transfers on household
welfare through risk sharing (Blumenstock et al. (2014); and Jack and Suri (2014)). Neither study
disentangles the impact of the mobile phone technology from the transfer mechanism.
In the former
case, the transfer is of money as airtime: they call it a “rudimentary form of mobile money”, but it is
not convertible for cash. A key result is that with geographical separation of giver and recipient, the
money transfer channel greatly reduces transactions costs compared to the alternatives when financial
infrastructure is poorly developed. Lower transaction costs could affect the size, frequency and
(sender) diversity of domestic remittances, and hence, the ability to smooth risk informally after large
shocks.

The Blumenstock et al. (2014) study lacks survey measures of welfare or wealth. Their
reported link between risk-sharing and money transfer is instead implied, given the consistency
between observed patterns of transfers and the characteristics of their theoretical models of reciprocal
risk sharing. They analyse the patterns of domestic person-to-person transfers of mobile airtime using
high-frequency administrative telecoms data. They exploit the random timing and location of
earthquakes in Rwanda, in a natural experiment, to identify covariate (as opposed to idiosyncratic)
economic shocks. They examine transfers in a specific window on either side of the disaster.
Mobile airtime is a precursor of mobile; the average amount transferred over the two month period is small at
around $1; the total additional influx (explicit transfers to all households in the affected area)
measured about $84 within 20km of the epicentre.

The dependent variable is gross transfer of airtime received by an individual at a particular
location and time. They use daily data in a differences-in-differences approach where the random
intervention is an earthquake, with a dummy capturing whether the user was near the epicentre at
the time of the shock, with time dummies and location fixed effects.85 They correctly report clustered
standard errors (see Bertrand et al. (2004), Section 8.1.1). In extended regressions they use innovative
predicted measures of expenditure (to proxy for wealth) and social connectedness (see Blumenstock’s
work in Section 7.4) and these are crossed with the shock dummy and a more intense version of this
dummy (days of severe shocks). They find, perhaps surprisingly, that as well as geographical

84 Weil et al. probably indirectly capture strata of wealth in their three schooling variables.
85 In variant regressions, they add a dummy for the user being near the epicentre at any time even in the absence
of a shock, and remove location fixed effects, replacing them in one regression by recipient fixed effects, and in
a second by a fixed effect controlling for the average intensity and direction of transfer flows between two users.

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proximity, transfers to victims near the epicentre after the Lake Kivu earthquake of 2008 are
determined by a past history of reciprocity between individuals, and the transfers decrease in the
wealth of the sender and increase in the wealth of the recipient. The opposite would obtain in a case of
charity or altruism.

Sending tiny amounts of airtime to friends and family in emergencies by mobile phone can be
inspired by different motives from that of sending cash to indigent victims. Considering the motive of
the giver, a small gesture of support when it may be difficult to find an agent to top up airtime under
disaster conditions easily strengthens an existing reciprocal relationship. One can conflate this motive
and charity, therefore. Moreover, the wealth of the recipient is likely be correlated with the size of his
or her geographical network; the poor may not have the same contact requirements with networks of
smaller size and geographical size. Ideally, the differences in such networks should be controlled for,
therefore, otherwise there is a selection problem as airtime does not in this sense have the same utility
in times of disaster for the wealthy and the poor. Finally, selection is induced by the fact that wealth
itself determines the ownership of phones in Rwanda in 2008 (see Blumenstock and Eagle, 2012).

The first econometric study to explore risk sharing and mobile money thoroughly is by Jack
and Suri (2014), and in diversifying to a new channel it extends earlier literature on risk sharing (e.g.
De Weerdt and Dercon 2006). They show how the expansion of mobile money (M-Pesa, introduced in
2007) and consequent reduced transactions costs has affected risk sharing amongst informal networks
of friends and family in Kenya, helping households to smooth consumption. They also use a
differences-in-differences approach where the random intervention is an idiosyncratic shock\(^{86}\), and
compare changes in the response of per capita consumption to shocks across M-Pesa users and
nonusers. The welfare measure is survey data on consumption\(^{87}\), from a household panel survey
conducted between late 2008 and early 2010; there is also a survey of nearly 8000 MPESA agents.
The dependent variable is annual per capita consumption for household \(i\) in location \(j\) in period \(t\). The
panel specification controls for household fixed effects, location-by-time dummies and rural-by-time
dummies. There is a dummy for a negative shock to income in the last six months, and a dummy for
an M-Pesa user in the household during the survey. These dummies are also crossed to test whether
M-Pesa users are better able to smooth risk.

The validity of the difference-in-differences specification depends upon the shock being
random. The authors note that M-Pesa use is endogenous “due to selective adoption associated with
wealth or other unobservables”. Their interest is risk-sharing, and hence such unobservables should
not also help households to smooth risk. Therefore, an included vector of controls\(^{88}\) is also crossed
with the shock dummy (in their equation 9) to reduce the effects of M-Pesa being correlated with
other variables that might help households’ smooth risk. The results show that the consumption of
mobile money users is unaffected by a range of negative income shocks (severe illness, job loss, fire,
livestock death, and harvest or business failure), while the consumption of non-users drops by 7 percent.
The effect is more evident for the bottom three quintiles of the income distribution. The ability to absorb
negative shocks is attributed to increases in the number and the size of remittances received, and to a
greater diversity of senders.\(^{89}\) Consumption responses are also compared for

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\(^{86}\) They consider “any negative shock”, which could be communal, like a drought and hence covariate; and “an illness shock”.

\(^{87}\) Self-reported consumption and perception of shocks are typically subject to measurement error.

\(^{88}\) This vector of observable individual characteristics includes household demographics, household head years
of education and occupation dummies (for farmer, business operator and professional), the use of financial
instruments (bank accounts, savings and credit cooperatives and rotating savings and credit associations), and
a dummy for cell phone ownership.

\(^{89}\) The report that households using mobile money transfer channels are about 13 percentage points more likely
to receive remittances, which on average amount to between 6 and 10 percent of annual consumption over a six-
month period.
households with differing access to agents using agent roll-out data in reduced form specifications, reinforcing the conclusions. The agent network grew four-fold over the period between surveys, and the authors argue that the roll-out of mobile money was random in Kenya.

A related exercise for Uganda draws on the above study, but with the essential difference that it uses a difference-in-differences specification where the random intervention is the adoption of mobile money, rather than a risk analysis (Munyegera and Matsumoto, 2014). The panel has two years, 2009 and 2012, and the dependent variable is monthly household per capita consumption. The panel specification controls for household fixed effects, location-by-time dummies and there is a dummy if the household uses mobile money services at the time of the survey. Other controls include a dummy for household mobile phone possession, household size, log of value of assets and land endowments, age, gender and education level of the household.

The problem with this specification has already been flagged by Jack and Suri (2014): the mobile money services dummy is endogenous, as adoption is correlated with wealth or other unobservables. Wealth (with self-reported measurement error) is controlled for, see above, but the coefficients are not reported. They appear to find for a fixed effects regression a 9.5 percent increase in household per capita consumption given the adoption of mobile money services. Disaggregating consumption into food, non-food and social contributions (ROSCAs, mutual funds, insurance and churches) finds an insignificant coefficient for food consumption (most food is self-farmed), and greatly higher coefficients for the other two, at 20 percent and 47 percent, respectively. The last points to one source of likely reverse causality as for instance ROSCA contributors routinely use mobile services for convenience. Thus, these fixed effects estimates may be biased up.

The authors try to control for the endogeneity of mobile money adoption by using instrumental variables; the instrument used is the distance to the nearest mobile money agent. The validity of the result depends on the instrument not being correlated with household and village characteristics that could affect household consumption. The findings are that per capita consumption increases by 72 percent upon adoption of mobile money. This is an unrealistic result, also sharply at odds with the initial results. The question arises again how random the roll-out of agents is. Are there selection biases toward communities which bring greater rewards to the agents, based on population density, wealth, education and other village and household characteristics that we know, from adoption studies, enhance adoption. The authors argue against this, and do not find significant correlation between such characteristics and mobile money agent placement (results not reported).

8.1.4 Public, donor or employer mobile money transfers

We discuss two papers that explore some impacts of public or employer mobile money cash transfers or wages transfers (Aker et al., 2014; and Blumenstock et al., 2013). Both use randomised controlled trials. They both identify cost savings from reduced transaction costs for the disbursing party, but there are different results for the recipient: cost savings in Aker’s study based in Niger; but possible cost increases in the Blumenstock et al. study in the more insecure environment in Afghanistan. The Aker et al. study does disentangle the mobile money delivery from ownership of a mobile phone, and finds improvements in household welfare after drought for cash transfer recipients, via greater diet

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90 This helps to control for endogeneity, since the agent roll-out is shown to be uncorrelated with observables.
91 They do, however, cautiously exclude in some regressions the urban centres of Mombasa and Nairobi.
92 It was not clear whether the monthly dependent variable was in logs and was nominal in a period of sharp (60 percent) inflation, during 2009-2012. Communication with the authors revealed that logs were used; and household per capita consumption was measured in adult equivalence units in real terms, constructed by dividing nominal consumption by household size and each consumption category was also deflated using standard price indices for each category provided by the Uganda Bureau of Statistics.
volume and diversity, and reduced depletion of asset levels. The Blumenstock et al. study distinguishes financial behavioural changes for recipients of wage transfers differentiated by salaries and salaries as a share of household income.\textsuperscript{93}

Aker et al. (2014) is a randomized evaluation study of a cash transfer programme via mobile money in Niger, one of the poorest countries in the world. Generally there is scant literature on the relative benefits and costs of electronic versus manual transfers.\textsuperscript{94} They identify cost savings for recipients and the public agency, household welfare improvements, and positive spill-over effects. Unconditional cash transfers following a drought were delivered through three channels: manual; electronic, together with a mobile money-enabled mobile phone; and manual, together with a mobile money-enabled mobile phone. By exogenously varying access to both the handset and mobile money, it proved possible (for the first time) to disentangle the impact of the technology from the electronic transfer mechanism. The relative costs and benefits of the three channels were compared.

For the mobile money channel, there was a reduction in transactions costs through reduced transport costs, travelling and queuing time, and an increase in intra-household bargaining power\textsuperscript{95} for women. Compared with other channels, the recipients increased their diet diversity (children consumed a third more of a meal per day), were more likely to cultivate and market cash crops conventionally grown by women, and had fewer depleted durable and non-durable assets. There was no evidence of “leakage” (i.e. of the transfer to corrupt intermediaries). The authors note that cost-savings are linked to a well-established agent infrastructure, often absent in West African countries where mobile money adoption has been lower. Costs otherwise could rise if access is difficult, and from possible “leakage” via private sector mobile money agents. In poor countries with poor literacy and greater financial exclusion, sufficient investment in the necessary payments infrastructure is a pre-requisite to realise savings. Thus, the generalizability of the results may be limited.

A recent randomized evaluation of a mobile money wage payments programme in Afghanistan, by Blumenstock et al. (2013), found significant reductions in the disbursing firm’s net costs from fewer ghost workers and other leakages, and savings on financial employees’ time. Less than 5 percent of the population is banked, and transactions costs are high for delivering wages as cash because of unreliable transport infrastructure and security concerns. But employees randomly assigned to the mobile salary payments group had to incur the costs of finding (liquid) agents where adequate mobile network and agent coverage existed; moreover, some had privacy concerns for security reasons. With lower transactions costs, the behaviour of employees randomly assigned to the mobile salary payments groups was altered. They made larger, more frequent airtime purchases each month (an extra $2 per month) and spent more in total on airtime. They increased usage of mobile transfers and mobile savings. On average, they left 20 percent of the average monthly salary in the account, with the average cumulative balance after 8 months at about US$68. Account usage patterns were heterogeneous: larger balances were maintained by previously banked employees, those with larger salaries, and those contributing higher shares of their household’s total income; but non-heads of households rapidly withdrew funds after the salary transfers. Surprisingly, surveys indicated that

\textsuperscript{93} This randomized controlled study appeared as a Policy White Paper in November 2013, without full econometric details, but subsequently disappeared from the website. Further, a review disputes the existence of evidence behind claims for reduced provider costs (Srinivasan et al., 2014, p4) saying it is merely anecdotal evidence. However, the following paper (not available online) is due to be presented in May 2015 at the 7th IEEE/ACM International Conference on Information and Communication Technologies and Development (ICTD ’15); Blumenstock et al. (2015).

\textsuperscript{94} Gentilini et al. (2014) document social protection programmes in 119 developing countries which mostly rely on poor infrastructure for costly distributions.

\textsuperscript{95} The authors found that cash-transfer recipients were able temporarily to conceal the arrival of the transfer, and were more likely than their manual cash counterparts to obtain the transfer on their own, travel to weekly markets and sell household grains.
savings fell with greater perceptions of insecurity, perhaps linked with limited agent access during periods of insecurity, or the greater demand for cash with uncertainty over future consumption decisions.

8.1.5 Analyses of savings behaviour and credit

There are several qualitative studies with localised implications for savings behaviour. We give a few examples, but concentrate on econometric work in this section. Wilson, Harper, and Griffith (2010, Chapter 9) describe how members of informal savings groups in Nairobi find it cost and time effective to use M-Pesa to move their cash weekly into a group account from the deposit collector’s account, especially with larger savings (since transactions costs for transfer are then lower). Jack and Suri (2011) conducted household surveys in 2008 and 2009 for early adopters of Kenya’s M-Pesa and those in a subsequent round, find that by 2009, 90 percent of early adopters use M-Pesa for saving (amongst other savings instruments and continued use of cash). They document reasons for an accumulation of balances by users (their Table 13), which include improved security (including safety of cash during travel), greater privacy, ease of use, reduced transactions costs, and for precautionary saving against emergencies. Mbiti and Weil (2011) find related results using the FinAccess 2009 survey for Kenya, and document similar socio-economic characteristics for savers as are explored econometrically by Demombynes and Thegeya (2012), see below.

An interesting conclusion from the quantitative work by Mbiti and Weil (2011) on the effects of M-Pesa adoption is the finding of a reduction both in the use of informal savings groups and in having to hide cash in secret places. They have no data on the amounts saved, only on methods of saving. They combine the 2006 and 2009 FinAccess surveys to create a balanced panel. They use a first differenced fixed effects regression and instrument the variable representing M-Pesa adoption, which is defined as the proportion of individuals that use M-Pesa in a sub-location. The set of instruments was based on responses about riskier, slower and more costly transfer methods.

Patterns of savings and factors driving two types of savings in Kenya, “basic mobile savings” and “bank-integrated mobile savings”, are examined by Demombynes and Thegeya (2012) using survey data.96 The former refer to M-Pesa savings balances (storage) which attract no interest rate. The latter consider M-Kesho97, or access to a bank account via a mobile phone for M-Pesa users that offers financial services beyond money storage and transfer such as paying interest and allowing access to loans or insurance. Probit regressions for savings in general98, where the dependent variable is a dummy equal to 1 if there are reported savings, found that savings are more likely for older individuals who are male, married, living in rural areas, and have higher levels of education, reported income, and wealth; and with these controls, M-Pesa users are 32 percent more likely to report savings. Very few people used M-Keso, but a probit where the dependent variable is a dummy equal to 1 if there are reported M-Kesho savings, yielded the same outcome: wealthier, married, more educated, and male.

However, the M-Pesa usage is endogenous, as discussed above. For instance, there are difficult to control for spill-over effects from community-learning about the product, and M-Pesa is also more likely to be adopted if the agent density is greater. Instrumenting for M-Pesa usage in the

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96 The survey was conducted by the Financial Sector Deepening Kenya organization covering 6,083 individuals, during October and November of 2010.
97 M-Kesho was the ill-fated savings product of a partnership between Safaricom and Equity Bank launched in 2010, but which quickly foundered because of difficulties Equity Bank and Safaricom had in managing the partnership. It was poorly promoted. The successor, M-Shwari, has flourished (Box 1).
98 Via M-Pesa, M-Kesho, PESA PAP, KCB connect, bank account, SACCO account, ASCA, ROSCA, Microfinance Institution and other.
same regression drops the coefficient to 20 percent. However, there are other sources of endogeneity hard to control for: savings may also be influenced by spillover effects, say through ROSCAs, and this could encourage M-Pesa usage simply for convenience (Wilson et al., 2010). This result, that savings appear greater for M-Pesa users, is thus indicative only.

The authors also regress the log of average monthly savings amounts on various controls (rural-urban, gender, age, marriage, education, wealth, income, and a dummy for M-Pesa registration) using OLS and an IV estimation (with the same instrument above). Controlling for those variables, M-Pesa users save 12 percent more than those not registered. In the IV regression, however, the coefficient for M-Pesa users is not statistically significant.

Finally, work by Batista and Vicente (2013) on the introduction of mobile money in Mozambique is still in progress, but a novel approach through experimentation lends insights into the desire to save through mobile money. They conduct games in treatment and control locations in rural provinces with experimental subjects. Targeted individuals in the treatment locations received education and dissemination about Mkesh, a local mobile money product. The authors examine willingness to save and remit to migrant family members in Maputo, and to save and remit particularly using Mkesh. Decisions were made using real money. Using OLS differences-in-differences regressions, the dependent variable is binary and they compare outcomes for target and control individuals with a treatment dummy variable and location-level (including regional dummies) and individual (demographic) controls, and correct standard errors by clustering at the location.

They find that the willingness to save through Mkesh and to remit through Mkesh increases when comparing target and control individuals. The effect for savings is 23–25 percentage points and for remittances is 26–27 percentage points, both significant at the 1 percent level. They conclude that the dissemination of Mkesh raised willingness to send money transfers regardless of the transfer method, and that at the margin Mkesh substituted traditional methods of saving. They argue that these are credible pointers to a future use of Mkesh SH for savings and remittances.

8.2 Macro-literature

In Section 6.2.2, the African Development Bank Economic Brief (ADB, 2012) was discussed as reflecting some of the confusions in the literature on the effects of variations in the money stock on inflation, while other important linkages between mobile money and inflation were absent.

The fairly simple annual model from 1964-2009 in the ADB’s Economic Brief is potentially misspecified by excluding key variables. It also covers two different regimes where the structure of inflation was probably different: the inflationary period of the 1960s and 70s, and the more recent lower inflation period. Since mobile money in Kenya only began in 2007, there are only three data points in the ADB’s model for mobile money, any inflation shocks in the period such as triggered by the violence that erupted in late 2007-early 2008 after Kenya’s disputed election, and not otherwise taken into account could be captured by the mobile money data. Thus, it is far from obvious that the role of the money stock in the ADB research is capturing fundamentals or whether it is merely correlated with the relevant omitted variables.

99 The instrument is the fraction of respondents in the sub-location registered with M-Pesa.
100 In the savings game the respondent was given about $1 which they could keep or save. If they saved then they either deposited through an Mkesh account (no interest paid) or in a sealed envelope where 25 percent would be added if the envelope was still sealed at the (uncertain) next visit of the enumerators. See Batista and Vicente (2013) for details of the randomisation and the experimental design and remittances game.
101 Controls include age, gender, years of education, marital status dummies, religion dummies, ethnic group dummies, property, and location offering primary school, secondary school, health centre, market vendors, police, church, meeting point, electricity supply, sewage, quality of network coverage, and time distance by bus to nearest bank.

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Only two other empirical papers to our knowledge address these issues with macro-data. Weil et al. (2012) suggest that without the presumption that the behaviour of monetary aggregates has a major bearing on inflation, “this area of policy would scarcely be worth much research effort”. Indeed arguments were presented Section 6.2 against a simplistic monetarist view linking money aggregates and inflation. They try to assess the effect of M-Pesa as a financial innovation on the stability of macro-money aggregates. They find evidence of instability from 2007 (when M-Pesa was launched), from a CHOW test with pre-chosen breakpoint of 2007q1, and using quarterly data on the M3 income velocity of circulation and other aggregates. Obviously no causal effect of M-Pesa on these aggregates can be attributed from this univariate test.

To isolate the possible impact of mobile money on inflation, it is essential to use well-specified multivariate inflation models with comprehensive controls. Failure to include proper controls will lead to biases, and the erroneous attribution of effects to mobile money that belong to omitted economic regressors in the model. Inflation models even in in advanced countries are often mis-specified (review in Aron and Muellbauer (2013)); there are few adequate inflation models in the African context.

Aron and Muellbauer (2015) model and forecast monthly inflation in East Africa to test for the possible effects of mobile money. They apply to Uganda, the sophisticated econometric forecasting models successfully used in an emerging market country, South Africa, and an advanced country, the US, Aron and Muellbauer (2012, 2013). The starting hypothesis is that inflation is a heterogeneous, state dependent process. Heterogeneity suggests that adjustment to relative price disturbances is part of inflation dynamics. Further, if the probability of price changes is state dependent, this implies that non-linearities are likely to be important. Energy and food price shocks can be sizeable, and the speed of price changes tends to rise with larger shocks.

Stable models for the 1-month and 3-month-ahead rates of inflation in Uganda, measured by the consumer price index for food and non-food, and for the domestic fuel price, were estimated over 1994-2013. Key ingredients were the use of multivariate models with equilibrium correction terms in relative prices; introducing non-linearities to proxy state dependence in the inflation process; and instead of using the information criterion, commonly used in VARs to select lag length, applying a ‘parsimonious longer lags’ (PLL) parameterisation (allowing far longer lags than usual). International influences through foreign prices and the exchange rate (including food prices in Kenya after regional integration) have an important influence on all three dependent variables, as does the growth of domestic credit. Rainfall deviation from the long-run mean is an important driver for all, most dramatically for food. The domestic money stock is irrelevant for food and fuel inflation, but has a small effect on non-food inflation. Other drivers include the trade and current account balances, fiscal balance, terms of trade and trade openness, and the international interest rate differential.

There is no serious evidence of a link between mobile money and inflation. For food inflation, mobile balances/M3 and transactions value/M3 have no significant effect, given the controls. For non-food inflation, mobile money effects are again insignificant. These findings suggest that concern regarding the potential velocity-inflation linkage of mobile money is misplaced. The hypothesis that mobile balances/M3 represent a planned build-up of liquidity just ahead of a significant increase in expenditure which might be inflationary is also not supported. There is no evidence that the advent of mobile money might transfer spending power to households with higher propensity to spend, so reduce saving and increasing demand. Increases in mobile balances/M3 more probably reflect the expansion of the mobile money infrastructure and its more widespread acceptance. It is more likely that the productivity and efficiency gains of mobile money have reduced inflation, even when quality improvements may not be fully measured in the CPI. For example, mobile money could make the

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102 This work was commissioned by the Melinda and Bill Gates Foundation (grant 23231).
effects of droughts and floods less disruptive by improving the matching of supply and demand of goods and services, and with lower transactions costs. With only five years of data since mobile money was introduced in Uganda, there must be considerable uncertainty over its long-term consequences for efficiency gains. But the evidence strongly suggests there is no reason for any alarm over its potentially inflationary consequences.

9. Incentives: the design of network structures and network agency contracts

The structure of agents’ networks and the design of agents’ contracts in mobile money systems affect profitability (Section 5.1). What makes such networks successful? A cause of financial exclusion is the prohibitively high cost of maintaining sufficient bank branches in remote areas to reach the population. With mobile phone technology, the consumers invest in the handset and the infrastructure is present for the distribution of airtime. The challenge is to create a wide-spread, efficient and active agents’ network to service electronic money accounts with cash deposits and withdrawals, transfer payments and potentially other services, and to register and promote active customers. The delegation to a network of “agents” by the “principal” (the mobile money operator) will function well if initial training of agents is sound, if a well-designed contract between principal and agent contains suitable incentives that can be altered over time, and if there is regular monitoring of adherence to the contract. Then an agency network can proxy for a wide-spread set of bank branches, operating at a fraction of the cost. The scope for contract design, however, depends on the institutional structures allowed by regulation. There are sharp regulatory differences amongst countries. The differing success rates and profitability of mobile money systems depend greatly on regulatory constraints.

9.1 The shape, size and exclusivity of networks

Networks can assume different shapes with various tiers of agents. Kenya and Uganda offer a contrast. The M-Pesa agent network is a uniform network where there is only one tier of agents by function, though retail and wholesale agents face different thresholds on their M-Pesa accounts and wholesalers typically serve to restock the retail agents (Box 1). Uniformity can foster trust, enhance transparency of service, and make for a more seamless registration and activation of accounts. The MTN-Uganda network is non-uniform and has two tiers of agents by function: the usual cash-in/cash-out agents as in M-Pesa, but also field registration agents who do not transact but sign-up new customers. This seems to be a model that can quickly acquire customers with more mobile registration agents, and promotion of the service may be more vigorous with a separation of the roles.

The optimal number of agents in a network is considered by Davidson and Leishman (2011). They suggest a three-phased approach to scaling the network. Initially, a sufficient number of agents is needed to launch the product with a geographical distribution linked to potential demand. Then resources should be deployed in a drive to acquire customers. When the customers appear to have convenient access to (liquid) agents then equilibrium can be judged to have been reached, and then the number of agents can be grown in proportion to active customers. Davidson and Leishman consider

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103 The following nomenclature is also used for third parties who act as agents for the principal (or mobile money provider): facilitators, cash merchants, and correspondent. Note that agents may not necessarily be true “agents” in the sense of having the legal authority to act for the principal, see Section 10.

104 Enforcement does not depend on ethnicity or family ties, as in the case of Hawala networks.

105 Potential demand can be gauged by operators from the geographical distribution of airtime transfer services between customers (a precursor of mobile money), and banking partners of operators may already conduct a domestic remittance service (an expensive substitute for mobile money).
that it is difficult to generalise about the ratio between customers and agents, given differing market conditions. Markets should not be over-saturated with agents, and they should be able to perform sufficient transactions to be more than compensated for their initial investment in mobile money (see below).106

There can also be tiers of customers and this was partly discussed under adoption in Section 4.3. To facilitate the growth of networks, for very small transactions more liberal registration requirements107 can be allowed. When transactions exceed a threshold, and more stringent requirements are needed, registration can be completed and the status of the account altered with greater storage and transactions thresholds (or automatically activated if the customer has registered previously). This has the advantage of encouraging transaction immediately after signing up, see below. A market with tiered access of this sort is a multi-tiered deposit account scheme since mid-2011 for the poorer customers of Mexican banks. Business customers can further be distinguished from others by a larger threshold for allowable transactions and allowing lower transactions costs for bulk delivery (see Box 1 and Kenya’s “Lipa na M-Pesa” business network).

Creating such a network is not a necessary part of the business of the Mobile Operator. There could be independent agents paid directly by the customers. However, as Claessens (2009) has observed, high fixed costs and large sunk costs in the production of wholesale financial services can mean significant first mover and scale advantages, possibly leading to natural monopoly. The dearth of agents to begin with, and the goal of a transparent and non-corrupt system that observes “know your client” regulations, means that to catalyse the operation, and promote adoption of the new mobile technology, a critical mass of reliable agents is required to reach a critical mass of customers. M-Pesa’s profitability in Kenya owes its success in large measure to the extensive agents’ network established by Safaricom (Box 1). Klein and Mayer (2011) observe that establishing the network, and the selection, training, monitoring and payment of the agents, represented a considerable investment by Safaricom to develop the market, and there are considerable ongoing costs (see Section 5.2). In recognition of the sunk costs, the Kenyan regulator initially allowed Safaricom to conclude exclusive agreements with the members of their distribution network.

There are important challenges for regulators in the choice of pathway for the development of these nascent markets. The Kenyan choice of light regulation initially, with exclusive advantages to the first mover, needed later to be countered to allow evolution of a deepening, efficient and competitive market. Di Castri (2013) argues that agent exclusivity is a matter for competition policy as ongoing exclusivity can constrain other providers from establishing effective distribution networks, stifling competition. The lessons from comparative experiences of regulation and competition policy are given in Section 10. Exclusivity for Safaricom’s agency networks was disallowed by the Competition Authority of Kenya as of 18 July 2014. References to exclusivity for mobile money products and services in agents’ contracts were replaced with non-exclusivity provisions, freeing agents to do business with other operators (Box 1).

9.2 On the recruitment, training and regulation of agents

Differences in managing a mobile money agency network as against airtime distribution, has been poorly understood by many operators (Lonie, 2013). Potentially mobile money providers can leverage

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106 For M-Pesa, the launch began with a few hundred agents, the ratio of customers to agents was quickly scaled to 1,000 in less than 18 months, whereupon Safaricom began to recruiting new agents more quickly than new customers.

107 Vodacom in Tanzania also accepts reference identification, where a family member, employer, or friend with a recognized ID document, vouches for a customer’s identity during registration (Pénicaud and Katakam, 2014).
retailers, rural banks, MFIs, money changers and airtime resellers. But Davidson and Leishman (2011) suggest that recruitment of the right type of agent for mobile money is crucial. Mobile money agents are not merely selling a product (like airtime retailers), but a service; they need to register and educate often illiterate customers, and promote awareness and activation; to maintain the cash-in/cash-out function, they need to conduct far more complex liquidity management of stocks of electronic money and of cash (than airtime retailers). Commensurately, oversight and training are both different and more intensive for mobile money agents than airtime resellers. Recruitment is consequently one of the most time-consuming and costly aspects of launching a new mobile money service. Some companies use “aggregators” with local informational advantage to sign up trusted and respected agents. With special incentives for signing up new agents, they do speed up the growth of a reliable agent network. They may also engage in ongoing management of the network.

Accounts of best practice and country experiences in recruitment methods and training are given by Davidson and Leishman op.cit.pp.9-11. Training is partly regulated to protect customers and providers against fraud; but it is important for the operator too to retain customers through quality of service and reputation. Some regulators require training on the KYC procedure and the detection of fraud, and may need to preapprove training materials. Eligibility criteria for agents are regulated but typically supplemented by the mobile money operators (see Davidson and Leishman, op.cit. p.11, for Safaricom’s requirements). Regulators may stipulate the types of allowed agents (commercial, non-profit, individual, or other), the minimum criteria to be registered as an agent (e.g. a business license or minimum capital), and the manner of approving agents (e.g. simple notification of the regulator by the operator, or a cumbersome authorisation procedure).

Regulatory practice concerning agents varies by country, and this is discussed by Di Castri (2013). She asserts that ‘building an efficient mobile money distribution network depends on proportional and cost-effective regulation’. An important feature is protection of customers, and depends on where the ultimate responsibility for the actions of agents lies. Good regulatory practice can exploit the appropriate incentives for the mobile money providers. Di Castri observes that if the provider is made liable for the actions of its agents, this guarantees that the provider will set up and monitor the distribution of its products properly. By relying on provider liability expressed through legal agreements, other restrictions can then be eased on the regulated criteria for recruiting agents. This is happening increasingly in practice, and should facilitate the development of the networks.108

9.3 Incentives and payments for agents

Contracts between operators and agents vary considerably across markets, but common clauses include: operators and agents being able to terminate the contract at any time; prohibition of sublicensing or delegating by the agent; agents maintaining a stipulated level of float; agents carrying out AML/CFT checking (for which they are trained) and meeting any reporting obligations of the operator; operators reserve the right to vary commissions at any time; agents use only marketing materials of the operator with which they are furnished.

The strategies of the mobile operator need to be dynamic. Globally, 30 percent of registered accounts were active in June 2013 (Pénicaud and Katakam, 2014), and only about half the 886,000 mobile money agents were active109. Best practice needs to be followed to reduce the costs of

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108 Di Castri also observes that in this case, a notification regime of agents with occasional regulatory inspection of agents can provide the same protection as a more unwieldy and slower authorisation regime of agents, but at a lower cost for the regulator, the provider, and the customer.

109 Active agents need to maintain inventory of electronic float and cash that is sufficient to preclude stock-outs most of the time. An agent should be performing at least 10 transactions a day, and the most successful perform 60-70 transactions on average a day (Pénicaud and Katakam, 2014).
inactivity. Agents can be motivated through incentives and different tiers of agents have been created in some countries. “Gaming” by agents can be reduced through tailored incentives and monitoring.

What commission is paid to agents? Lonie (2013) expresses the potential agent’s opportunity cost: they must invest their cash in an e-money float account, which could otherwise be used to purchase inventory for their core business; incentives in the initial contract must be sufficient to provide a return on their mobile money investment that makes it worthwhile to divert resource from their core business until the service reaches critical mass and becomes a significant income stream. Agents are paid a flat fee to register customers which covers their costs of verifying documents and educating the customer. Agents are paid a portion of the transactions fee, sometimes by the mobile money operator, sometimes directly by customers. The median percentage of transaction revenue paid to agents globally is 50 percent (Pénicaud and Katakam, 2014). Some operators pay different commissions to different categories of agents. Davidson and Leishman (2011) predict that separating classes of agents based on the transaction values which they are empowered to perform could in future make the service more attractive to high and low value customers.

Some operators have raised the level of commission temporarily to drive the accumulation of new customers. Econet Zimbabwe sacrificed short-term profits in the launch of Ecocash to build a strong distribution network, paying their agents 80 percent of the earnings, and achieving a million active users with 18 months (Levin, 2013). Incentives can also be provided to agents to create active customers. Pénicaud and Katakam (2014) report data from an anonymous operator which suggests that customers who transact at the point of registration are more likely to be future active customers (26 percent more likely) and produce significantly higher mobile money revenue per user (95 percent higher) than those who register without transacting. Commission can be added to the flat fee for registration if the customer transacts after account verification. To avoid gaming at registration, there can be delayed incentives whereby the agent is paid not just after one transaction at time of registration, but if there are further stipulated transactions in a subsequent fixed period.

The use of growth targets or tiers can also motivate and differentiate agents. Short-term campaigns to reach a target with rewards may help grow the business or act as a “tipping point” to accumulate a critical mass of customers. Tiers of agents serve to differentiate top performers from others based on performance measures (e.g. growth) and this creates incentives through rankings. Higher tier agents receive greater support and promotional material than lower tiers. The monitoring of the network is thereby also improved.

10. Reviewing the impact of regulation on the spread, uptake and growth of mobile money

“The question for policymakers and regulators is whether to impose rules on market participants that lead to greater connection among account providers or whether to let matters develop so as not to interfere with incentives to innovate given the rapid technical developments and the difficulty in assessing fully the consequences of regulatory action.” (Klein and Mayer, 2011).

With the novelty and the rapid growth of mobile money systems, the parallel regulatory development has been caught somewhat off-balance. The multi-faceted role of a financial regulator of mobile

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110 Agents use their own cash and are not custodians of cash or electronic money that belongs to users or to the mobile money provider.

111 For instance, South Africa’s Standard Bank Community Banking has small shops, bank branches and bill-payment counters as agents, each with a different tariff structure for customers and reflecting different allowable transactions values.

112 A customer making a first transaction at sign up is 49 percent likely to become an active customer, but 39 percent likely without transacting on registration.
financial services should include the protection of consumers, dispute resolution, setting operational and security standards, ensuring a stable financial system through appropriate prudential regulation, and fostering market competition (Cousins and Varshney, 2014). In emerging market economies, transformational models of mobile payments make financial inclusion a further objective. The regulation of the mobile money systems in principle spans several areas of existing law, including banking, consumer protection, commercial law and competition policy; international law; and ICT law. An added complication is that non-bank operational entities fall outside regulation of the formal financial sector (e.g. the telecommunications companies operating mobile money, like Safaricom in Kenya, or in the Philippines), yet entail financial risks.

Some countries responded with stringent protective restrictions in the early stages, stultifying growth and innovation, and creating barriers to entry (e.g. India, Maikin, 2009). Others, notably Kenya, initially adopted a light-touch regulation and then adapted and tightened regulation over time as markets grew. While this flexible approach fosters investment, innovation and new entry, it nonetheless carries risks for investors and customers. Thus, a delicate balancing act in an evolving and uncertain situation is required, often with limited regulatory capacity, and even limited means of national identification of consumers. There has been little empirical research on the implications of regulation for outcomes in this new market (Cousins and Varshney, 2014), but early experience suggests it is crucial to get regulation right at the outset, as it shapes the viability and variety of business models, competition and innovation in the sector, and affects financial stability.

We explore if there are regulatory lessons already for the newer mobile payments systems. We take a two-pronged approach, presenting an extended Klein-Mayer table of disaggregated components, risks and regulatory requirements for mobile systems (Klein and Mayer, 2011); then we look at accumulated cross-country experience in a separate table, and review general lessons.

10.1 The Klein-Mayer approach to regulation of mobile payments

The new payments systems involve various “partnership models”, non-bank-led or bank-led joint ventures, depending on the rules in individual countries. They also “unbundle” functions that traditionally have been the domain of banking organisations. Klein and Mayer (2011) suggested little thinking had developed in addressing how new mobile money services differed from traditional banking. The fact that regulation straddled several areas of the law led to some confusion in adapting existing law to the new systems. The Klein-Mayer approach is systematically to unbundle the new systems into component services, to assess which “slice of risk” is associated with each distinct function, and to judge whether existing commercial law or prudential regulation sufficiently covers the risks, or whether further law needs to be enacted. This agrees with the Bank for International Settlements (BIS)-recommended approach for regulating international remittances by type of service rather than by type of entity offering services, to avoid market distortion (BIS/World Bank, 2007). Thus, regulation of mobile money systems should address the functions and characteristics of the services offered, and proportionate to the specific risk of each service (see also BIS (2012)).

Table 3 extends the original table of Klein and Mayer (2011) to include further functions for mobile money systems, and appends competition implications. The component service functions are registration of customers, exchange of electronic money for cash (and vice versa), storage of electronic money, saving with interest in linked bank accounts, domestic transfers, foreign transfers, provision of credit scores, extension of credit via linked bank accounts, extension of insurance, and

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113 For instance, compliance with the Financial Action Task Force (FATF), the global standard setting body for anti-money laundering and combating the financing of terrorism (AML/CFT).

114 A full risk analysis for mobile money systems, for consumers, agents, operational entities, and banks holding trust funds, is given in USAID (2010).
investment. Issues of pricing and subsidies, and interoperability fall within the ambit of competition policy. A key point is that the function of “investment” is not carried out by non-bank operators. They are not allowed to invest or intermediate consumers’ pooled funds, but this is done within the prudentially-regulated banking sector by a partner bank. This was discussed already in Section 6.2.1, when examining creation of money; see also below.

10.2 Cross-country experiences

Of the many external features influencing the design and implementation of mobile money services, of those that impede a mobile money service attaining scale, ‘only regulation seems to pose challenges too great for a service to overcome’ (Di Castri, 2013). The regulatory environment affects the design and viability of the mobile payments systems. Regulatory barriers may compromise effective distribution networks, operational efficiency and cash generation, limit growth of the customer base and financial inclusion, and act as a disincentive to innovation and investment.

Several authors describe the regulatory experiences of a range of early adopters (e.g. Gutierrez and Singh, 2013; di Castri, 2013; Pénicaud and Katakam, 2014). Table 4 compiles a comparative typology of regulatory features for a selection of countries. The table indicates such features as the financial inclusiveness of regulation, the partnership model between banks and non-bank entities, where responsibility for the customers’ pooled deposits lies, formal guidelines, whether agents are used and who bears ultimate responsibility for their actions, and whether there is interoperability.

We summarise the critical lessons toward ‘an enabling policy and regulatory framework (that) creates an open and level playing field that fosters competition and innovation’ (Di Castri, 2013). The first and most important is that regulators’ qualms about licensing non-bank operators to offer mobile money services are misjudged, and this is deleterious to the development of such markets. An MNO-led operation is better suited in terms of infrastructure, skills and incentives than a bank-led operation. MNOs have experience in building and operating an established network; there is brand recognition and marketing skills; at low cost, mobile money can be appended to existing services (airtime and data provision) for current and new customers. Section 5.2 pointed out that MNOs benefit both directly and indirectly from revenue from mobile services, helping to sustain the service. Banks lack these assets and incentives; bank-led models may be conservative and risk-averse in deployment (for instance, by not allowing a multi-tiered registration procedure115), and may even resist deployment if they consider mobile services to be in competition with their services (e.g. payments). Sharing thin profits equably between the two may further impede the success of the operation.

Two main factors explain the rejection of non-bank-led mobile money deployment. They provide limited financial services to customers contrasting with “full” financial inclusion through the formal banking sector. But this misunderstands the barriers to financial inclusion which mobile money has helped to solve (see Section 4.2), and how mobile money platforms have provided a pathway to later banking inclusion through credit extension, insurance and savings products (Sections 3.4 and 3.5). The more cogent objection is against licensing a non-bank to offer financial services with financial risks, but without being legally subject to prudential oversight. This has been neatly surmounted in many countries by requiring a partnership between the (service-leading) MNO and one or more fully prudentially-regulated banks, where the electronic value in the customers’ mobile

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115 Licenced bank operators frequently insist on the same level of identification for mobile money users as for bank customers.
money accounts is fully or partially backed up in bank accounts. The role of the partner bank is thus only as custodian of the funds\textsuperscript{16} and it is not involved in the commercial aspect of the deployment.

Best practice would see a 100 percent cash backing where diversification of the pooled funds into more than one bank account spreads risk for more mature deployments. Some jurisdictions may allow investment in low risk securities like government bonds. If the accounts are required to be trust or escrow accounts\textsuperscript{17} (see Section 6.2.1) then liquid funds are held on behalf of customers, and are ring-fenced from the issuer’s funds, and protected from claims by the issuer’s creditors.\textsuperscript{18} If the non-bank provider becomes insolvent, then the funds accrue fully to the consumers, in accordance with the regulatory procedures for that country. The non-bank provider, which is not prudentially-regulated, may not intermediate these funds, therefore; however, the banks do intermediate the pooled funds by lending them on, and in consequence they provide interest\textsuperscript{19} on the deposits (Section 6.2.1). If the bank should become insolvent, the pooled funds are protected by deposit insurance, should this be available.\textsuperscript{20} Even when it is available, the coverage is typically low, e.g. up to US$1060 currently in Kenya for individual deposits (where a depositor has more than one account in an institution, all accounts are consolidated for a single settlement). Diversifying into several banks, see Afghanistan in Table 4, partially mitigates against bank failure, as would raising the ceiling for deposit insurance on such pooled funds. In the US, for pooled custodial accounts, there is pass-through protection for each customer up to the insurance limit. This may not automatically apply in developing countries, and should be regulated for, or one insurance payout would apply to the account as a whole presenting a considerable risk to mobile money customers in the event of bank failure.\textsuperscript{21}

A second lesson is that tiered regulatory requirements for the registration of new customers to mobile payments schemes should be adopted. The Klein-Mayer principle of regulating according to specific risk by function applies here. Sometimes onerous identity requirements have impeded the adoption of mobile money. In developing countries, a system of national identity cards may not exist; few poorer customers will have identity documentation (e.g. voter’s card, driving licenses, tax certificate, social security cards, and passports); and the addresses of customers are often unclear or without utility bills to prove them.\textsuperscript{22} Adopting proportionate Know Your Customer (KYC)

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\textsuperscript{16} In Uganda, the partner bank has to satisfy the fiduciary responsibility in all transactions concerning these escrow funds. There are requirements for customer identification documentation, daily reconciliation of the escrow account and the e-money, and the bank’s authority to distribute the funds in the escrow account to mobile money account holders in case of insolvency or bankruptcy of the mobile money service provider, see the Bank of Uganda Mobile Money Guidelines (2013).

\textsuperscript{17} Both escrow and trust accounts are managed by an independent third party, but a Trustee often has broader duties than an escrow agent. Escrow accounts can be considered a special and narrow type of trust relationship. In France, the relevant concept is a fiduciary agreement (Di Castri, 2013).

\textsuperscript{18} The cumulative balance in the mobile money trust accounts held by Tanzanian commercial banks in January, 2014 was TZS 254.6 billion (US$128 million), di Castri & Gidvani (2014).

\textsuperscript{19} There are differing arrangements for what happens to this interest (see Table 4). In Kenya it is paid to charity; but by Trust law, and this is stated explicitly in the Kenyan Guidelines, this Trust income could be allocated to the beneficiaries of the trust (i.e. the customers) as in Tanzania since 2014. It makes sense for the customers to be compensated pro rata from Trust account income given the inflationary degradation of their deposits, while the custodial bank earns loan interest on these funds. This should promote savings in electronic accounts. Some have earlier argued that the electronic deposits of the non-bank providers should pay interest to motivate savings (Ehrbeck and Tarazi, 2011). However, this concept of non-bank interest is prudentially challenging as mobile providers do not intermediate the funds. Note that some mobile platforms have developed to allow mobile-associated interest-paying bank accounts (e.g. M-Shwari, in Kenya, Box 1).

\textsuperscript{20} For example, Rwanda and Ghana are still developing deposit insurance schemes.

\textsuperscript{21} An alternative solution is mentioned by Di Castri (2013): that of insuring deposits through an insurance company, but entails the payment of premia, the effect of which on customers’ costs would need to be transparently revealed.

\textsuperscript{22} To combat absent ID documentation flexible approaches have been adopted in various countries (e.g. Fiji) allowing reference letters from prescribed referees (e.g. local village council letter or certificate, company-
procedures entails making use of other mitigation tools, such as transactions limits, and hence can simplify customer due diligence (CDD). Since the poorest customers require a low threshold of transactions and consequently pose low risk, a tiered registration requirement can promote adoption with fewer formalities in the initial stage that can be geared up when higher thresholds are required. Proportionate registration requirements are crucial to realizing the objective of financial inclusion of the unbanked without compromising financial integrity at higher levels of usage. Table 4 shows that most of the developing countries have adopted the Financial Action Task Force (FATF) recommendation of a proportionate approach to risks posed by money laundering and the financing of terrorism. Generally, the move from cash to recorded transactions in electronic mobile money accounts enhances financial integrity by reducing anonymity and making money traceable. Providers have stringent regulatory requirements to keep full records and backups. Most systems have automated single transaction limits as well as daily and monthly transactional limits, and limits on stored balances, which “place sand in the wheels” of instantaneous finance. Unusual behaviour can be detected by systems monitoring.

This traceability is of great importance in extending mobile money systems to include international transfers, as discussed in Sections 3.6 and 6.2.3.

A third lesson concerns regulation of agents, and this has been discussed in detail in the preceding Section 9. Table 4 shows that in the high uptake countries, agent networks were deployed. An efficient distribution network has been crucial to M-Pesa’s success in Kenya (Box 1). Again, proportionate and cost-effective recommendation is recommended to accelerate adoption by active customers. A model that works well in terms of provider incentives to monitor properly is where providers are made liable for the actions of agents executed on its behalf within a contractual principal-agent agreement. Regulators are then more comfortable to leave choice of agents and training to providers, and only to set standards for vetting and training agents. This helps avoid regulation that restricts the types of agents that may be employed. Another aspect that benefits from a light touch regulation is a flexible regime where the authorities (central bank) is notified of recruitment of agents and has the prerogative to inspect such agents, but does not have to authorize these agents before they can operate.

A fourth lesson concerns the beneficial promotion of transparency through market conduct regulation for consumer protection, including price and fees disclosure and simple clear contracts on customers’ rights and obligations. Against this, complex and expensive standards should be avoided for low value transactions. Customers should also be made aware of effective complaints procedures. Di Castri (2013) observes that issues of privacy and data protection are partly addressed by national privacy laws, telecommunications regulation, financial regulation, but most by business practice. Compliance costs with regulated requirements for data privacy, including backups of data, should be assessed with operators.

Finally, there is the issue of interoperability. Few countries in Table 4 have adopted interoperability. The execution of interoperability is technically complex and compliance costs will rise, challenging the business viability of mobile money. Sophisticated contractual agreements will be required amongst market players for platform level, distribution level or customer (SIM card) level interoperability. The current position seems to be that interoperability will in due course become a

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employer-issued ID, government-issued ID). Di Castri (2013) observes that in many of the markets where mobile money is working best, digital photos and physical forms are not requirements.


124 Apart from the mobile phone number, unique PIN identification is required for transactions, and the unique Mobile Station International Subscriber Directory Number (MSISDN) is recorded for each transaction.
desirable (market-led) goal with mature and viable deployments with strong and active customer bases. However, the increased complexity for regulation and also sensitive decisions on competition policy will be challenging in governance-constrained environments.

A promising cross-country study tries to relate usage to enabling regulation, with constructed regulatory indices and micro-Global Findex usage data for 35 countries (Gutierrez and Singh (2013). The indices comprise six sub-components associated with an enabling environment and these are either equally-weighted or assigned weights through a Principal Components methodology. The dependent variable is a dichotomous variable (receive, send or pay bills with mobile money or a combination of these) and a logit regression includes both country characteristics and individual (micro-) characteristics. Unfortunately, the authors face the problem that the index may be correlated with omitted country characteristics. By using fixed effects, they are unable to include the index itself, but only its interaction with individual characteristics. Most possible instruments for the index have the same possible problem of correlation with omitted country characteristics. The interaction effects nevertheless yield useful insights, such as the fact that a regulatory framework that supports interoperability promotes higher usage among the poorest and that stronger consumer protection reduces their usage perhaps through raised costs; while amongst the educated, greater consumer protection raises usage. Another wave of Global Findex data could allow the direct effect of a regulatory index to be tested in a fixed effects panel regression. The authors are aware that de facto rather than de jure regulations should enter an index, or in other words, that it is the quality or performance of the existing regulations that matter.

11. Charities, donors and international agencies and the beneficial growth of mobile money

It should not be forgotten that the most successful mobile payments system, the first to reach operational viability, and the one that grew the fastest providing the impetus for copycat systems throughout Sub-Saharan Africa, MPESA in Kenya, began as a donor initiative by DFID (see Box 1).

The part played by country aid agencies, other donors, charitable foundations and international agencies in the beneficial growth of mobile money systems design, usage, monitoring, statistics provision, tracking, regulation, transparency, public information, and analyses of various types, provides a solid model for how such commitments can forge an enormous impact, working alongside governments, NGOs, academics and private commerce. Flexibility has been shown and adaptation too, for instance in the evolving provision of innovative data and redressing the lack of demand and usage data. Moreover, the effort has been one aimed at international coordination and cooperation, not only amongst countries and organisations, but also with inter-disciplinarity amongst academic disciplines. The process has been democratic, open, educative and transparent.

The Appendix Table A1 demonstrates funded work on data in particular. Some examples are the IMF and the World Bank’s contributions and funded contributions to providing quantitative measures of remittances, financial services provision and usage, which are largely publically available data. CGAP125 estimates that in 2012 over $29 billion was committed to support financial inclusion by 22 international funders of financial inclusion (those covering almost 90 percent of the 2011 commitments). The role of the Bill & Melinda Gates Foundation has been pivotal126. Initiatives

125 http://www.cgap.org/data/trends-international-funding-financial-inclusion
126 More generally, the Bill & Melinda Gates Foundation expenditure in the area of mobile money includes commitments of $35 million to the AFI and $24 million to the Consultative Group to Assist the Poor (CGAP). A search of the funding database of the Gate Foundation reveals 10 grants between 2010-2014 totalling nearly $37 million, and including substantial support for GSMA Mobile for Development Foundation Inc..
funded include the Alliance for Financial Inclusion (AFI), a network of financial inclusion policymakers founded in 2008 as a Bill & Melinda Gates Foundation-funded project, now evolving into a permanent member-funded international organization; mapping projects such as MIX’s Geospatial Maps and Fspmaps.com; and demand side data commissioned from Gallup, and via Intermedia, The Financial Inclusion Insights (FII) program, The Financial Inclusion Tracker Study (FITS) and Tanzania Mobile Money Tracker Study (TMMTS), as well as 2011 Global Financial Inclusion (Global Findex) Database. The work of GSMA Mobile for Development Foundation Inc. and its extensive web-based educative and documentary products and data collection is also supported by Bill & Melinda Gates Foundation, in conjunction with independent philanthropic foundations such as the Mastercard Foundation and the Omidyar Network, and governments (such as the UK through DFID).

12. Conclusion: whither mobile money, and future research

This survey has gathered the burgeoning information on the phenomenal growth of mobile money and its economic influence, and surveyed academic research. The possibility for mobile money to improve financial inclusion for the unbanked will be heavily influenced by ongoing technological innovation and commercial market profitability. Looking ahead at possible trends produces two types of predictions, the first based on the likely impact from changes in technology, and the second on the likely catch-up of lagging nations, which depends on enabling regulation and some other factors. We discuss these, consider possible areas for future academic research, and ways to improve data provision and analysis for policy-makers. [To be completed]

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Abbreviations:

African Development Bank (ADB)
Alliance for Financial Inclusion (AFI),
Anti-Money Laundering (AML)
Business-to-Person (B2P)
Center for Financial Inclusion (CFI)
Combating the Financing of Terrorism (CFT)
Consumer Price Index (CPI).
Customer due diligence (CDD)
Department for International Development (DFID)
Differences-in-Differences (DD)
Fair Isaac Corporation credit scores (FICO)
Financial Action Task Force (FATF)
Financial Inclusion Insights (FII)
Financial Inclusion Tracking Surveys (FITS)
Global Financial Inclusion Database (Global Findex)
Government-to-Person (G2P)
Global System for Mobile Communications, originally Groupe Spécial Mobile (GSM)
Groupe Speciale Mobile Association (GSMA)
Identity Document (ID)
IMF’s Financial Access Survey (FAS)
Information Communications Technology (ICT)
International Telecommunications Union (ITU)
Know Your Customer (KYC)
Mobile Network Operator (MNO)
Mobile Money for the Unbanked (MMU)
Mobile Station International Subscriber Directory Number (MSISDN)
M-Pesa (“M” for mobile, “Pesa” for “money” in Swahili)
M-Shwari, Lipa na M-Pesa and MKESHO (mobile money system offshoots in Kenya, see Box 1)
Near Field Communication (NFC)
Ordinary Least Squares (OLS)
Personal Identification Number (PIN)
Person-to-Business (P2B)
Person-to-Person (P2P)
Randomised Controlled Trials (RCT)
Research on Poverty, Environment and Agricultural Technology (RePEAT)
Rotating Savings and Credit Association (ROSCA)
Savings and Credit Co-operative (SACCO)
Short Message Service or text (SMS)
Subscriber Identification Module of GSM phones (SIM card)
Tanzania Mobile Money Tracker Study (TMMTS)
Third-Generation (3G) and Fourth-Generation (4G)
World Bank’s Global Financial Development Database (GFDD)
Figure 1: Global landline availability and mobile phone subscriptions: 2005 and 2013

Source: ITU World Telecommunication/ICT Indicators database, see Appendix Table A1.
Notes: “Mobile phone subscribers” refer to active SIM cards rather than individual subscribers.

Figure 2: Global commercial bank branch and ATM densities: 2011

Source: G20 Financial Inclusion Indicators database, World Bank, see Appendix Table A1.
Notes: 2011 is the latest available year. The first five regions refer to “developing only”.
Figure 3: Number of live mobile money services for the unbanked by region

Source: Adapted figure Scharwatt et al. (2015), Figure 2.  
Notes: Dated December, 2014. The numbers of services in some years have been revised from Pénicaud and Katakam (2014), where 1, 2, 3, 5, 6, 7, and 11 are numbered for 2001 to 2007, 66 for 2010 and 179 in 2012.
Figure 4: Numbers and growth of mobile money accounts

a. Mobile money accounts per 100,000 adults

![Bar chart showing mobile money accounts per 100,000 adults across different regions.]

Source: Data from Pénicaud and Katakam (2014); adapted Figure 6, Pénicaud and Katakam (2014); updated with https://gsmaintelligence.com/topics/3363/dashboard/

Note that by December 2014, there were 299 million registered accounts of which 103 million were active.

b. Numbers and growth of total registered and active accounts

![Line chart showing growth of registered and active mobile money accounts from Q4 2010 to Q2 2015.]

Source: Data from Pénicaud and Katakam (2014); adapted Figure 6, Pénicaud and Katakam (2014); updated with https://gsmaintelligence.com/topics/3363/dashboard/

Note that by December 2014, there were 299 million registered accounts of which 103 million were active.
Figure 5: Aggregate Ugandan mobile money data

Source: Bank of Uganda

Notes: The value of transactions and the money balance on customers’ accounts (Shs).
BOX 1: Detailed anatomy of Kenya’s mobile money system

**Origin and Size:**
Kenya’s mobile money system was the first in Africa. It originated in 2006 in an experiment for loan payments via mobile phones in micro-credit schemes, initiated by a donor (the Department for International Development (DFID), UK) with Vodafone. In March 2007, Safaricom, the Kenyan (40%-owned) subsidiary of Vodafone, listed on the Nairobi bourse, launched a payments service. M-Pesa, with the slogan “send money home”, exploiting the proliferation of mobile phone ownership in Kenya. Within seven months there were over a million active customers, and by the end of 2010 over half of adult Kenyans signed up. M-Pesa allows instant domestic transfers of money by secure SMS message from a registered M-Pesa customer’s electronic mobile money account to any other individual, whether registered or not, without using formal bank accounts. The transactions are authorised and recorded in real time, with graduated transactions costs. M-Pesa filled a void in the market since bank branches are poorly distributed, few can afford bank accounts, and alternative long distance payments methods (Western Union, and via bus drivers) are expensive or insecure. The success of the M-Pesa relies on a well-monitored network of agents to process transactions, see below. Nearly 8 years on, 6 operators serve the market in Kenya, though Safaricom still controls two-thirds of the market. There were 19.95 million registered M-Pesa customers by September 2014 (a 10% increase in the year), of whom 12.8 million were “active” (transacting in the previous 30 days). M-Pesa revenue grew by 24.7% to about US$170 million in the 6 months to September, 2014, comprising nearly a fifth of Safaricom’s total revenue. The Bank of Kenya records that in June 2014, taking into account all operators, the monthly value of transactions was about US$2 billion, or about 60% of average monthly GDP. The FinAccess (2013) survey revealed that the proportion of the adult population using formal financial services rose to 67% in 2013 from 41% in 2009, driven by mobile money (classified as formal financial services but with “non-prudential” oversight).

**Systems structures and regulatory regimes:**
In Kenya in August, 2014, the National Payment System Regulations were issued under the National Payment System Act, providing a legal framework for mobile money, and formalising and extending prudential and market conduct requirements for mobile money providers as previously articulated in the letters of no objection from the Central Bank of Kenya (CBK). The CBK has duties of oversight, inspection and enforcement. There are mechanisms for consumer protection, redress and confidentiality of data.

In Kenya, banks and non-banks, including mobile network operators (MNOs), may provide mobile money services. The MNOs operate the telecommunications infrastructure, and contract, train and monitor the widespread networks of agents that interact with the customers, registering users and offering cash deposit and withdrawal functions and payments from electronic accounts held outside the formal banking sector. The net deposits from customers have to be invested in prudentially regulated banks for safe-keeping. These “escrow” accounts back 100% of the money of the participants in the mobile money service who have deposited cash in exchange for electronic money; and the banks are required to satisfy the institution’s fiduciary responsibility in all transactions concerning these escrow funds (customer identification documentation, daily reconciliation of the escrow account and the e-money, and authority to distribute the funds in the escrow account to mobile money account holders in case of insolvency or bankruptcy of the MNO). No lending or investment of such funds is allowed; these funds are strictly separated from the service provider’s own accounts and safeguarded from claims of its creditors. The Safaricom interest income is covenanted to charity.

The early agent exclusivity arrangement was formally outlawed in July, 2014 when the Central Bank of Kenya ordered Safaricom to open up the M-Pesa agent network to other operators in a bid to improve fair competition and encourage lower fees for customers. There is not yet interoperability of platforms; users of mobile money services have to affiliate with multiple mobile providers, but a interconnection deal between Vodafone and MTN was announced in April 2015.

**Agency network:**
By September, 2014, there were 80,330 M-Pesa mobile money agents countrywide (compared with about 2.43 commercial bank branches per 1000km² in 2013). Establishing an agency network and the training and payment of agents represents a considerable early investment by operators to develop the market. M-Pesa distinguishes between wholesalers and retail agents, but these merchants are not “agents” in a strict legal sense of having the...
legal authority to act for the service provider. Retail cash merchants transact with their own cash and electronic money in their own M-Pesa accounts to meet customer demand. Wholesalers (banks or non-bank merchants) are allowed higher limits on electronic money stored in their M-Pesa accounts and perform a cash management service for retailers, who typically transact daily with wholesalers, depositing cash or withdrawing cash depending on their net intake of cash. The cash provision function is beginning to move from in-store cash merchants to street-based merchants. M-Pesa trains retail agents to open accounts observing identity checks required by anti-money laundering legislation. Agents are compensated by M-Pesa out of the transaction fees charged to customers, see below. But a different model in Airtel in Kenya delegates payments of agents to customers. The FinAccess (2013) survey indicates that for 85% or urban dwellers and 58% of rural dwellers, the nearest agent is in walking distance. Thus, transport, waiting time and other transactions costs are much reduced.

**A payments platform for individuals:**
Mobile phone users purchase a SIM card with the mobile money “app” for their phone, register with a retail agent using a national identity card and acquire an electronic mobile money account. They deposit money into the account by giving cash to the agent, and receive, in return, “book entry money” via their mobile phone. To withdraw money, they transfer book entry money via their mobile phone to the cash merchant’s mobile money account, and receive cash in return. Electronic money can be sent from a customer’s account to another account holder, and money can be sent to those who are not account holders. The latter transaction is more expensive, and the remitter’s own account is debited. A text message (SMS) with a code is sent to the recipient, authorising a retail agent to transfer money from the remitter’s account into cash for the designated recipient. The maximum allowed account balance is Ksh100,000 (~US$1100), maximum daily transaction is Ksh140,000, maximum per transaction is Ksh70,000, and the minimum allowed transfer is Ksh10 (US10cents).

Globally, of the total product mix by value, airtime top-up comprises 9.4%, bill payment comprise 10.8% and P2P transfers, 68.3%, with an average 1.3 transfers per active user per month and an average value of US$38 (Pénicaud and Katakam, 2014). For Kenya too, the predominant transactions are non-bank payments services such as buying airtime, paying bills and school fees, and P2P transfers. But there have been innovations, see below, to formal savings products, small loans and micro-insurance through partner banks (supported by credit scores), more business and government usage for payments of various types, and international remittances.

**Transactions costs:**
Depositors do not receive interest on their electronic accounts and bear the risk of loss of value through inflation. They pay the cost of transferring and withdrawing money, but there is no charge for depositing money. The graduated withdrawal fee pays for the cost of the M-Pesa account, ranging in 2015 from about 0.5% for large transfers to 20% for the smallest. The costs of transfer are 10% for the smallest transfers, falling by half at transfers of US$220, and to 2% for US$500.

**Expanding to business usage and payments platform**
Corporate Kenyan M-Pesa accounts have higher transaction limits than for individuals, and bulk business to customer payments can be made. The “Lipa na M-Pesa” network numbered over 139,600 (and 32,000 active) merchants in September 2014; it facilitates customer payments without transaction fees for goods and services (below a threshold), entering the business till number via the M-Pesa “Buy Goods” option. Representative of the drive to encourage cashless business payments, in December, 2014 Safaricom announced an instant rewards system to promote petrol payments using the Lipa Na M-Pesa platform, following schemes such as Lipa Kodi for rent and Lipa Karo for school fees payments. In November 2014, Safaricom launched M-Ledger, its first (free) branded smartphone app, with basic accounting tools for individuals and small businesses. Business usage has grown in Kenya with customer to business payments accounting for 10.4% average monthly value of payments in the M-Pesa H1 2013/14 results, and B2P (businesses transferring to suppliers and paying employees) contributing 8%. The business related average transfers exhibited 90% growth on 6 months earlier as compared to 16% for person-to-person average transfers. Data on business use are limited, but the FITS Uganda study (2012) found 19% of mobile money users using mobile money as part of their business, receiving payments from customers or paying suppliers.
Expanding to a savings and micro-credit platform
In Kenya, M-Shwari is a savings and loan product operated entirely from the mobile phone launched in November 2012 by Safaricom and Commercial Bank of Africa, in partnership. In September, 2014 there were 4.5 million active users (doubling over 6 months) with net deposits of Kshs 4.1bn and borrowings of Kshs 1.6bn. Customers can move funds between their M-Pesa account and M-Shwari bank savings account (with no minimum balances or charges, and paying graduated interest rates between 2 and 5%). The new Lock Box service now pays higher interest rates for fixed deposits. M-Pesa subscribers of 6 months standing can apply for an M-Shwari loan sans fees or paperwork: an algorithm based on their M-Pesa transactions history creates an initial credit score and initial loan limit. Loan disbursement and repayment is via M-Pesa, without loan interest charges, but with a facility fee of 7.5 percent (note, however, that this resembles an interest rate and at a high annual compounded rate of 138 percent). Loans sizes (ranging from US$1to US$235) have a 30-day term but can be rolled over at a monthly fee of 7.5%. Follow-up loans depend on savings and loan repayments history. Non-performing loans in late 2014 numbered only 2.2% of the portfolio. M-Shwari raised the number of deposit accounts in this bank from under 35,000 to over 5 million in less than a year (Pénicaud and Katakam, 2014).

Expanding to a micro-insurance platform
In January 2014, an affordable M-Pesa health micro-insurance product was launched in partnership with investment firm Britam and Changamka Micro Insurance. Targeting a million M-Pesa customers, the suggested annual premium of Ksh 12,000 (about US$140) would buy family cover worth Ksh 290,000, for in and out patient, maternity, dental, optical, hospitalization, and in the case of death, funeral expenses.

Expanding to international (diaspora) remittances
Greater interoperability between different types of accounts as created by M-Shwari can help promote international remittances as a mobile money service (Pénicaud and Katakam, 2014, p32). Kenya received an estimated US$1.5 billion of international remittances in 2014 (World Bank Migration Brief 23). The CBK recorded a 20% increase in remittances since August 2014. The company partnered with Skrill, a UK-based online payment company. In November, 2014, MoneyGram, a large global money transfer companies, and Safaricom, announced a new service, to be launched in early 2015, enabling the remittances from over 90 countries worldwide to be sent directly to M-Pesa. Safaricom has a similar agreement with Western Union.

Government and donor usage of mobile payments
Governments can securely pay policemen and other officials their wages, the national revenue authority can accept tax and licences payments and fines, and municipalities can accept parking payments and public transportation services payments by mobile-money services. They can also be used to deliver social welfare or aid payments. Some of these payments are a reality in Kenya, through pilots or fully-functioning systems, with M-Pesa and Airtel. However, the government to person (G2P) salary and social payments have lagged in Kenya relative to Afghanistan, Tanzania and Malawi.

Geographical expansion of the successful M-Pesa model
Vodafone has concentrated on proliferating its mobile money platform in markets that are heavy cash users. Currently, M-Pesa is used in nine countries other than Kenya, by order of roll-out: Tanzania, Fiji, South Africa, Fiji, DRC, India (launched in 2013), Mozambique Egypt, Lesotho, and Romania (launched in 2014).
### Table 1: Global trends in international remittances and their costs

#### Global trends in remittances

<table>
<thead>
<tr>
<th>Region/country</th>
<th>US $ billions</th>
<th>2010</th>
<th>2013</th>
<th>2015(f)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All developing countries</td>
<td>334</td>
<td>418</td>
<td>440</td>
<td></td>
</tr>
<tr>
<td>East Asia &amp; Pacific</td>
<td>95</td>
<td>113</td>
<td>125</td>
<td></td>
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<tr>
<td>Europe &amp; Central Asia</td>
<td>32</td>
<td>52</td>
<td>42</td>
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<tr>
<td>Latin America &amp; Caribbean</td>
<td>56</td>
<td>61</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Middle-East &amp; North Africa</td>
<td>40</td>
<td>49</td>
<td>53</td>
<td></td>
</tr>
<tr>
<td>South Asia</td>
<td>82</td>
<td>111</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>29</td>
<td>32</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td><strong>World</strong></td>
<td><strong>454</strong></td>
<td><strong>557</strong></td>
<td><strong>586</strong></td>
<td></td>
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<tr>
<td>Low-income countries</td>
<td>24</td>
<td>33</td>
<td>35</td>
<td></td>
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<tr>
<td>Middle-income</td>
<td>310</td>
<td>385</td>
<td>405</td>
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<tr>
<td>High income</td>
<td>120</td>
<td>139</td>
<td>146</td>
<td></td>
</tr>
</tbody>
</table>

#### Global costs of remittances

<table>
<thead>
<tr>
<th>Region/country</th>
<th>Total average cost of sending US$200, including fees and exchange rate margins/%</th>
<th>2010q1</th>
<th>2013q4</th>
<th>2014q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>East Asia &amp; Pacific</td>
<td></td>
<td>9.3</td>
<td>8.3</td>
<td>8.1</td>
</tr>
<tr>
<td>Europe &amp; Central Asia (excl.</td>
<td></td>
<td>8.3</td>
<td>6.3</td>
<td>6.2</td>
</tr>
<tr>
<td>Russia)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td></td>
<td>8.1</td>
<td>7.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Middle-East &amp; North Africa</td>
<td></td>
<td>8.2</td>
<td>7.8</td>
<td>8.6</td>
</tr>
<tr>
<td>South Asia</td>
<td></td>
<td>6.0</td>
<td>6.6</td>
<td>5.9</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td></td>
<td>10.9</td>
<td>12.6</td>
<td>11.5</td>
</tr>
<tr>
<td><strong>World</strong></td>
<td></td>
<td><strong>8.7</strong></td>
<td><strong>8.6</strong></td>
<td><strong>8.0</strong></td>
</tr>
</tbody>
</table>

*Sources: Remittance Prices Worldwide; World Bank Migration and Remittances Data, Migration and Development Brief no 24 (13 April, 2015)*


1. Excludes Remittance Service Providers that do not disclose the exchange rate applied.
Table 2: Typology of selected empirical studies on economic effects of mobile money with micro-data

<table>
<thead>
<tr>
<th>Study</th>
<th>Data</th>
<th>Method</th>
<th>Endogeneity &amp; other issues</th>
<th>Claimed result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adoption</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Munyegera and Matsumoto</td>
<td>Balanced panel of 838 households generated from the 3rd &amp; 4th rounds</td>
<td>Probit regression and linear probability model with household fixed effects; Controlling for: ownership of a mobile phone and whether the household has a migrant worker (dummies), district x time dummies, age and age squared, gender and education (years of schooling), distance to nearest mobile money agent, size of household and effects of wealth (land size and total assets).</td>
<td>Cannot find a gender effect, nor an age effect; distance to the agent is important as is wealth. Dummies for ownership of the phone and migrant worker are significant.</td>
<td></td>
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<tr>
<td>(2014)</td>
<td>of household and community surveys in Uganda, 2009 &amp; 2012 (RePEAT)</td>
<td></td>
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<tr>
<td>Dependent variable:</td>
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<td></td>
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<tr>
<td>Munyegera and Matsumoto</td>
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<tr>
<td>(2014)</td>
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<tr>
<td><strong>Private domestic remittances using mobile money or an early version of mobile money (prepaid airtime)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Munyegera and Matsumoto</td>
<td>Balanced panel of 838 households generated from the 3rd &amp; 4th rounds</td>
<td>Panel differences-in-differences regressions, the random intervention is the introduction of mobile money; Instrumental Variables: Controlling for: household fixed effects, location-by-time dummies, dummy for household mobile phone possession, household size, log of value of assets and land endowments, age, gender and education level of the household. [instrument: distance to nearest mobile money agent]</td>
<td>The use of distance to nearest agent is a suspect instrument. There are possible issues with zeroes or small numbers in the log specification – may account for the disaggregated results. Use shares of expenditure to total consumption.</td>
<td>For fixed effects regression: 9.5% increase in household per capita consumption given the adoption of mobile money services. Disaggregating consumption into food, non-food and social contributions (ROSCAs, mutual funds, insurance and churches) finds an insignificant coefficient for food consumption (most food is self-farmed), and greatly higher coefficients for the other two, at 20% and 47%, respectively. For IV regression: per capita consumption increases by 73 percent upon adoption of mobile money (but 38% standard error!)!</td>
</tr>
<tr>
<td>(2014)</td>
<td>of household and community surveys in Uganda, 2009 &amp; 2012 (RePEAT)</td>
<td></td>
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<td>Dependent variable:</td>
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<tr>
<td>Munyegera and Matsumoto</td>
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<tr>
<td>(2014)</td>
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</tr>
<tr>
<td>Jack and Suri (2014)</td>
<td>Kenya, household panel survey conducted between</td>
<td>Panel differences-in-differences regressions, the random</td>
<td>“Stable” consumption?</td>
<td>Kenyans with access to mobile money are better able to smooth consumption</td>
</tr>
<tr>
<td><strong>Private domestic remittances using mobile money or an early version of mobile money (prepaid airtime)</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Study</td>
<td>Data</td>
<td>Method</td>
<td>Endogeneity &amp; other issues</td>
<td>Claimed result</td>
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<tr>
<td>-------</td>
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</tbody>
</table>
| **Dependent variable:** annual per capita consumption for a household at a particular location and time | late 2008 and early 2010; a 2010 survey of nearly 8000 MPESA agents. | intervention is an idiosyncratic shock \( \neq \); **Controlling for:** household fixed effects, location-by-time dummies, rural-by-time dummies, dummy for negative shock to income in last six months, dummy for an M-Pesa user in the household in survey, plus vector of controls.  
Vector of controls is crossed with the shock dummy (equation 9). | Evidence suggests higher expenditure after negative shocks, rather than stability, perhaps on repairs, medical treatment. | than those without. Transactions cost savings mean stable consumption following negative income shocks, from the greater frequency, geographical diversity and size of remittances |

Blumenstock, Eagle, and Fafchamps (2014a)  
**Dependent variable:** gross transfer of airtime received by an individual at a particular location and time  
Rwanda, 2005-09, daily primary telecom operator’s log of activity (50 billion transactions: calls, text messages, and airtime transfers and purchases), 1.5 million subscribers; 2005 Rwanda Demographic and Health Survey; 2009/2010 phone survey of 1,000 individuals on household asset ownership and housing characteristics. | Panel differences-in-differences approach, the random intervention is an earthquake;  
**Controlling for:** dummy for user near the epicentre at time of shock, time dummies, location fixed effects.  
**Variant regressions:** add dummy for user near epicentre at any time; remove location fixed effects, replacing in one regression by recipient fixed effects, and in a second by a fixed effect controlling for average intensity and direction of transfer flows between two users.  
**Variant regressions:** add predicted measures of expenditure (to proxy for wealth) and social connectedness crossed with shock dummy; and more intense version of shock dummy (days of severe shocks).  
[Clustered standard errors] | People make transfers to individuals affected by economic shocks. The magnitude of these transfers is small in absolute terms. Transfers are more likely to be sent to wealthy individuals, and are sent predominantly between pairs of individuals with a strong history of reciprocal exchange |

**Public cash transfers using mobile money**  
Aker, Boumnijel, McClelland, and Tierney (2014)  
Niger, 2010-11. Household survey of 1,152 recipients in 96 intervention villages across 3 rounds; Village-level survey; anthropometric data on children; weekly price data in 45 markets. | Randomised Controlled Trials (RCT). | Transactions costs reduced, especially travelling and queuing time. Increased intra-household bargaining power for women. Increased diet diversity; better nutrition for children; more likely to cultivate and market cash crops; fewer depleted durable and non-durable assets. No evidence of “leakage”. |

**Wage payments using mobile money**  
Blumenstock, Callen, and Afghanistan, seven | Randomised Controlled Trials (RCT). | Significantly reduced net costs for the
<table>
<thead>
<tr>
<th>Study</th>
<th>Data</th>
<th>Method</th>
<th>Endogeneity &amp; other issues</th>
<th>Claimed result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghani (2014)</td>
<td>provinces, Aug. 2012 to Mar. 2013. Sample: 341 employees of Central Asia Development Group. Mobile operator Rosha transaction records, interviews, phone surveys, administrative records.</td>
<td>First differenced fixed effects regression and instrument the variable representing M-Pesa adoption, which is defined as the proportion of individuals that use M-Pesa in a sub-location.</td>
<td>disbursement firm; larger and more frequent airtime purchases and more spent in total by recipients; increased usage of mobile transfers and mobile savings by recipients, but with usage patterns differing by prior banking status and size of salary. Greater liquidity preference and savings withdrawal with increased perceptions of physical insecurity.</td>
<td></td>
</tr>
<tr>
<td>Batista and Vicente (2013)</td>
<td>Dependent variable: Binary dummy variables for willingness to save and remit to migrants in Maputo, and to save and remit using M-KESH (mobile money)</td>
<td>OLS differences-in-differences approach, the random intervention is introduction of mobile money; controlling for: treatment dummy variable and location-level (including regional dummies) and individual (demographic) controls.</td>
<td>Instrument may not be completely exogenous.</td>
<td>Willingness to save and to remit through M-KESH increases when comparing targeted and control individuals. The significant effect for savings is 23-25 percentage points and for remittances is 26-27 percentage points. Dissemination of M-KESH raised willingness to send money transfers regardless of transfer method, and at the margin mKESH substituted traditional methods of saving.</td>
</tr>
<tr>
<td>Demombynes and Thegeya (2012)</td>
<td>Dependent variable: PROBIT: zero-1 dummy: for reported general savings; &amp; zero-1 dummy; for reported M-KESH savings (savings account with interest accessed via phone for mobile money users)</td>
<td>Probit and IV Probit regressions for savings in general &amp; for M-KESH savings controlling for: rural-urban, gender, age, age squared, marriage, education, wealth, income, and a dummy for M-Pesa registration</td>
<td>Instrument may not be completely exogenous.</td>
<td>Savings more likely when older, male, married, living in rural areas, and have higher levels of education, reported income, and wealth; with these controls, M-Pesa users are 32% more likely to report savings. (Very few used M-KESH, but yielded the same outcome: wealthier, married, more educated, and male.) Instrumenting for M-Pesa usage drops the coefficient to 20%. Using OLS: M-Pesa users save 12% more than un-registered. Using IV: the coefficient for M-Pesa users is not statistically significant.</td>
</tr>
<tr>
<td>Mbti and Weil (2011)</td>
<td>Dependent variable: Kenya: combine the 2006 and 2009 FinAccess surveys to create a balanced panel</td>
<td>First differenced fixed effects regression</td>
<td>Responses could be correlated with other factors.</td>
<td>Effect of M-Pesa adoption is to reduce both the use of informal savings groups and having to hide cash in secret places.</td>
</tr>
<tr>
<td>Study</td>
<td>Data</td>
<td>Method</td>
<td>Endogeneity &amp; other issues</td>
<td>Claimed result</td>
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<tr>
<td></td>
<td></td>
<td>{Set of instruments based on responses about riskier, slower and more costly transfer methods}</td>
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</tr>
</tbody>
</table>

**NOTES**

a Social contributions expenditure on ROSCAs, mutual funds, insurance and churches.

b They consider “any negative shock”, which could be communal, like a drought and hence covariate; and “an illness shock”

c Vector of controls (Jack and Suri, 2014): observable individual characteristics includes household demographics, household head years of education and occupation dummies (for farmer, business operator and professional), the use of financial instruments (bank accounts, savings and credit cooperatives and rotating savings and credit associations), and a dummy for cell phone ownership.

d Vector of controls (Batista and Vicente, 2013): age, gender, years of education, marital status dummies, religion dummies, ethnic group dummies, property, and location offering primary school, secondary school, health centre, market vendors, police, church, meeting point, electricity supply, sewage, quality of network coverage, and time distance by bus to nearest bank.

e M-Pesa, MKESHO/PESA PAP, KCB connect, bank account, SACCO account, ASCA, ROSCA, Microfinance Institution and other.
Table 3: Expanded Klein-Mayer table of disaggregated functions, risks and regulation for mobile money

[To be added]

Table 4: Comparative country regulatory regimes

<table>
<thead>
<tr>
<th>Members of Alliance for Financial Inclusion 2015 [a.]</th>
<th>Afghanistan</th>
<th>Brazil</th>
<th>Cambodia</th>
<th>India</th>
<th>Kenya</th>
<th>Pakistan</th>
<th>Philippines</th>
<th>S. Africa</th>
<th>Tanzania</th>
<th>Uganda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Has an enabling regulatory approach 2015 [b.]</td>
<td>Yes</td>
<td>Yes</td>
<td>Regulatory barriers still exist</td>
<td>Regulatory barriers still exist</td>
<td>Yes</td>
<td>Regulatory barriers still exist</td>
<td>Yes</td>
<td>Regulatory barriers still exist</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Partnership model: bank-led or non-bank-led?</td>
<td>Bank</td>
<td>Bank. But draft rules aim to license 'Payments Banks', as 'differentiated or restricted banks'.</td>
<td>Non-bank (M-Pesa); and bank/ non-bank partnerships; from 2011, also bank-led (Eazzy247)</td>
<td>Bank</td>
<td>Non-bank</td>
<td>Bank</td>
<td>Non-bank, but must partner with a Bank of Tanzania licensed bank</td>
<td>Non-bank, but must partner with a Bank of Uganda licensed bank</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service provider/s 2015[d.]</td>
<td>M-Paisa, mHawala, My Money</td>
<td>Meu Dinheiro, Oi Carteira, TIM, Multibank, Caixa, Zuum</td>
<td>Wing, ACLEDA Unity, Cellcard</td>
<td>Aircel ICICI Mobile Money, Airtel Money, Alpha Money, Beam Money, BSNL SBI Mobile Money, Eko, Idea Money, M-Pesa, M-Wallet, MoneyOnMobile, mRupee, Oxigen Wallet, State Bank Mobicash,</td>
<td>Airtel Money, M-Pesa, MobiKash, Orange Money, PAYG Platform, Tangaza Pesa Mobile Money Transfer, Yucash</td>
<td>Easypaisa, HBL Express, Mobicash, Mobile Paisa, TimePey, UBL OMNI, Upaisa</td>
<td>GCash, SMART Money</td>
<td>Community Banking, FNB eWallet Solutions, M-Pesa, Mobile Money, Mxit Money, WIZZIT</td>
<td>Airtel Money, ezyPesa, Tigo Pesa, Vodacom M-Pesa</td>
<td>Airtel Money, EzeeMoney, M-Sente, MCash, MTN Mobile Money</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Afghanistan</th>
<th>Brazil</th>
<th>Cambodia</th>
<th>India</th>
<th>Kenya</th>
<th>Pakistan</th>
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<th>Uganda</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Suvidhaa Money, Union Bank Money</td>
<td></td>
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</tr>
<tr>
<td>Licences/letter of no objection from central bank</td>
<td>Permission given to bank to outsource payment transactions services third-party processor/s</td>
<td>Licence banks. Proposal is to grant a licence to ‘Payment Banks’</td>
<td>Authorisation certificate to payment service provider (MNO)</td>
<td>Letter of no objection letter to licenced bank</td>
<td>Letter of no objection letter to licenced bank</td>
<td></td>
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</tr>
<tr>
<td>Trust or Escrow account to safe-guard customer funds</td>
<td>Funds must be held in a local currency in licensed banks.</td>
<td>Pooled funds in licenced bank</td>
<td>Pooled funds in licenced bank. Draft proposal is to ring-fence, liquid assets.</td>
<td>Trust account with 1 or more banks. Ring-fenced, liquid assets. Above a threshold, have to be placed in at least two banks.</td>
<td>Pooled funds in licenced bank</td>
<td>Must maintain unencumbered liquid assets in bank deposits, certain government securities, or any other liquid asset permitted by the central bank.</td>
<td>Trust account with a single licenced Bank, 100% coverage, ring-fenced. New regulations</td>
<td>Escrow account in the licenced bank. Ring-fenced, liquid assets. BOU may require diversification over several licensed institutions.</td>
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<tr>
<td></td>
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</tr>
<tr>
<td><strong>Bank deposit insurance rules 2015</strong> (*= IADI Members [e.])</td>
<td>Yes</td>
<td>Yes*</td>
<td>Under study</td>
<td>Yes*</td>
<td>Yes*</td>
<td>Under study</td>
<td>Yes*</td>
<td>Under study</td>
<td>Yes*</td>
</tr>
<tr>
<td><strong>AML/CFT regulation &amp; compliance 2015</strong> [f.]</td>
<td>Yes/in progress</td>
<td>Yes compliant</td>
<td>Yes compliant</td>
<td>Yes compliant</td>
<td>Yes compliant</td>
<td>Yes compliant</td>
<td>Yes compliant</td>
<td>Yes compliant</td>
<td>Yes compliant</td>
</tr>
<tr>
<td><strong>Proportional KYC requirements</strong></td>
<td>Yes</td>
<td>No.</td>
<td>No.</td>
<td>Aim to achieve in Draft rules.</td>
<td>Yes</td>
<td>Yes: low-value accounts, but require national ID card.</td>
<td>Yes: but limited: permit providers to wait up to 90 days before verifying certain information.</td>
<td>Yes: low-value accounts, banks do not need verify residential address, tax number, or keep records of ID.</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Non-bank agent network</strong></td>
<td>Yes, any retail establishment</td>
<td>Yes, merchant network.</td>
<td>Yes, only cooperatives, non-profit entities, and postal system within 30km radius of bank branch</td>
<td>Yes; Agent Banking Guidelines (2011) allowed banks to use agency networks</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Legal responsibility for actions of agents</strong></td>
<td>Bank</td>
<td>Mobile money service provider.</td>
<td>Bank</td>
<td>Authorized payment service provider.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>MFS Consumer protection regulation</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>In progress</td>
<td>Yes, but not MFS-specific</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Afghanistan</td>
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<td>Cambodia</td>
<td>India</td>
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</tr>
<tr>
<td>No</td>
<td>No</td>
<td>WING is connected to all mobile network operators.</td>
<td>No</td>
<td>Yes (April, 2015)</td>
<td>Yes (2014)</td>
<td>No</td>
<td>No</td>
<td>Yes (2014)</td>
<td>Yes (April, 2015)</td>
</tr>
<tr>
<td>Medium</td>
<td>Low</td>
<td>Medium-low, mainly over the counter</td>
<td>Low to medium</td>
<td>High</td>
<td>Mainly over the counter</td>
<td>High</td>
<td>Medium</td>
<td>Medium to high</td>
<td>Medium to high</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes, via VISA</td>
<td>No</td>
<td>Yes, several int’l partners</td>
<td>In progress with MTN</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
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</tr>
</tbody>
</table>

Sources: This table also draws on Bilodeau et al. (2011); Cousins and Varshney (2014); Flaming et al. (2013); Di Castri (2013); di Castri & Gidvani (2014); GSMA website.

Notes:
[a.] Members of Alliance for Financial Inclusion.
[b.] Of the 89 markets where mobile money is live, only 47 markets have an enabling regulatory approach, while in the other 42 markets regulatory barriers still exist: http://www.gsma.com/mobilefordevelopment/is-regulation-holding-back-financial-inclusion-a-look-at-the-evidence
[c.] Additive models: append a channel to existing financial services for users. Transformational models are targeted at the unbanked without financial services. Additive models in developing countries can be found in Cambodia, Vietnam and Indonesia.
[d.] See Mobile Money Tracker: Appendix Table 1: http://www.gsma.com/mobilefordevelopment/programmes/mobile-money-for-the-unbanked/insights/tracker
[e.] http://www.iadi.org/iadi_members.html
[g.] Interoperability “The ability for customers to undertake money transfers between two accounts at different mobile money schemes, or to transfer money between accounts at mobile money schemes and accounts at banks. To date, MNOs in four markets have interoperated their mobile money schemes.” Scharwatt et al.(2015). See also http://www.businesswire.com/news/home/20150420006824/en/Vodafone-M-Pesa-MTN-Mobile-Money-Agree-Interconnect on 2015 interoperability.

[Some blanks still to be confirmed and added]
<table>
<thead>
<tr>
<th>Organisation</th>
<th>Website/Publication name</th>
<th>Data collected</th>
<th>Coverage</th>
<th>Web Address</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MOBILE MONEY</strong></td>
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<tr>
<td>GSMA (association representing global mobile operators using GSM (Groupe Speciale Mobile) technology and associated industrial companies (e.g. software companies))</td>
<td>MMU (Mobile Money for the Unbanked) Mobile Money Deployment Tracker [an online live Database]</td>
<td>Live and planned mobile money services (for the unbanked) globally, including the providers, name of the mobile money service, its launch date, the financial products offered, and which partners are involved in delivering each service. In 2014, extended to include information on mobile insurance services and mobile credit and savings services. [Source: members of association]</td>
<td>Live (continuous), by country/region</td>
<td><a href="http://www.gsma.com/mobilefordevelopment/programmes/mobile-money-for-the-unbanked/insights/tracker">http://www.gsma.com/mobilefordevelopment/programmes/mobile-money-for-the-unbanked/insights/tracker</a></td>
</tr>
<tr>
<td>GSMA</td>
<td>MMU Global Adoption Survey of Mobile Financial Services [Database is not public - Summary in Pénicaud &amp; Katakam (2014)]</td>
<td>Standardised operational metrics about mobile money services, self-reported (confidential) through a global survey of mobile money providers. Where sensible, estimates are made to complete the data set (e.g. in 2013 report, numbers of mobile money accounts (both registered and active) are estimated). [Source: confidential survey]</td>
<td>Annual survey conducted for Sep-12, Dec-12, Mar-13, and Jun-13 (ongoing). GSMA estimates that it covers the majority of the industry as larger mobile money providers tend to participate each year; in 2013: 110 participants from 56 countries, about half of the 219 live mobile money services in the world (98 responded on mobile money, 21 on mobile insurance, and 16 on mobile credit and savings).</td>
<td><a href="http://www.gsma.com/mobilefordevelopment/programmes/mobile-money-for-the-unbanked/insights/industry-reports">http://www.gsma.com/mobilefordevelopment/programmes/mobile-money-for-the-unbanked/insights/industry-reports</a></td>
</tr>
<tr>
<td><strong>ICT STATISTICS-COVERAGE AND MARKET DATA</strong></td>
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</tr>
<tr>
<td>GSM (Groupe Special Mobile)</td>
<td>GSM World Coverage Map and GSM Country List</td>
<td>GSM Bands information by country</td>
<td>Global, up to date</td>
<td><a href="http://www.worldtimezone.com/gsm.html">http://www.worldtimezone.com/gsm.html</a></td>
</tr>
<tr>
<td>Ericsson</td>
<td>Ericsson Mobility Report</td>
<td>In-depth data traffic measurements from the early days of mobile broadband</td>
<td>2010-2020, global, regional</td>
<td><a href="http://www.ericsson.com/er">http://www.ericsson.com/er</a></td>
</tr>
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</tbody>
</table>
| June 2014    | [Traffic Exploration graphics tool] [Downloadable data] | from a large base of live networks: internal forecasts, network coverage, current traffic and market trends. Traffic and subscriptions – regional forecasts by device type | | icsson-mobility-report  
http://www.ericsson.com/TE T/trafficView/loadBasicEdito r.ericsson |
| Wireless Intelligence/International Telecommunications Union (ITU is the official source for global ICT statistics) | World Telecommunication/ICT Indicators database December 2014 (18th Edition) [Limited downloadable data; can buy data] | Data for more than 150 telecommunication/ICT statistics covering fixed telephone network, mobile-cellular telephone subscriptions, quality of service, Internet (including fixed- and mobile-broadband subscription data), traffic, staff, prices, revenue, investment and statistics on ICT access and use by households and individuals. | Data for over 200 economies. Time series data for the years 1960, 1965, 1970 and annually from 1975 to 2013 Data collected from annual questionnaire, usually from the regulatory authority or the ministry in charge of telecommunication and ICT. Additional data are obtained from reports provided by telecommunication ministries, regulators and operators and from ITU staff reports. In some cases, estimates are made by ITU staff; these are noted in the database. Household data. | http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx |

**INTERNATIONAL REMITTANCES FLOWS & COSTS OF TRANSFER**

<p>| The World Bank | Remittance Prices Worldwide [Downloadable data] | Provides data on the cost of sending remittances globally. | Covers 219 &quot;country corridors&quot;, including 32 major remittance sending countries and 89 receiving countries, covering over 60% of total remittances to developing countries. | <a href="http://remittanceprices.worldbank.org/en">http://remittanceprices.worldbank.org/en</a> |
| The World Bank | Send Money Africa | Provides data on the cost of sending relatively small amounts of money from selected countries worldwide to a number of African countries, as well as African corridors | | <a href="http://sendmoneyafrica.worldbank.org">http://sendmoneyafrica.worldbank.org</a> |</p>
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</thead>
<tbody>
<tr>
<td><strong>FINANCIAL INCLUSION INDICATORS</strong>&lt;br&gt;<strong>USER (NATIONAL DEMAND–SIDE DATA)</strong></td>
<td></td>
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<tr>
<td>The World Bank (Bill and Melinda Gates Foundation commissioned; Gallup)</td>
<td>2011 Global Financial Inclusion [Global Findex] Database [Downloadable data; graphics]</td>
<td>Survey of users (demand-side data). Measures how adults in 148 countries save, borrow, make payments and manage risk. Nielsen (2014) comments: “the definition of formal financial services is based on people’s perception of whether their provider is a formal financial institution, which is not necessarily aligned with the regulatory and supervisory framework of a country” and that “the sample is randomized at the individual level, which allows users to aggregate the data by individual characteristics, such as income and gender, but this also makes the data incompatible with household-level surveys”.</td>
<td>Covers 148 countries for the 2011 survey. The 506 indicators are disaggregated by gender, age, education, income, rural vs urban. Limited usage data on mobile money is included. A 2014 survey with expanded data on payments will be released in April 2015. The following survey will be done in 2017.</td>
<td><a href="http://datatopics.worldbank.org/financialinclusion/">http://datatopics.worldbank.org/financialinclusion/</a></td>
</tr>
<tr>
<td><strong>USER (HOUSEHOLD OR INDIVIDUAL DEMAND–SIDE DATA)</strong></td>
<td></td>
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</tr>
<tr>
<td>FinMark Trust</td>
<td>FinScope SME surveys (first piloted in 2002 in South Africa) [Online reports]</td>
<td>Nationally representative surveys of how small business owners source their income and how they manage their financial lives. The survey looks at owners of micro, small, and medium enterprises, as well as individual entrepreneurs.</td>
<td>FinScope MSME surveys have been implemented in 6 SADC countries; other surveys are being implemented. They are not fully comparable across countries.</td>
<td><a href="http://www.finmark.org.za/finscope/finscope-sme/">http://www.finmark.org.za/finscope/finscope-sme/</a></td>
</tr>
<tr>
<td>FinMark Trust</td>
<td>FinScope consumer surveys [Online reports]</td>
<td>Nationally representative surveys of how individual people source their income and how they manage their financial lives and focuses on adults in a particular country.</td>
<td>Conducted in 18 countries (15 in Africa of which 10 are in the SADC region, 3 in Asia). There is no standard definition of “financial inclusion” across surveys.</td>
<td><a href="http://www.finmark.org.za/finscope/finscope-consumer/">http://www.finmark.org.za/finscope/finscope-consumer/</a></td>
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<tr>
<td>Tanzania Mobile Money Tracker Study (TMMTS)</td>
<td>drivers and barriers to mobile money expansion.</td>
<td>FITS: Pakistan (5000 HH), Tanzania (3000 HH), Uganda (3000 HH), three year panel survey study tracking the same households. Start in early 2012. TMMTS: individual-level quarterly surveys conducted in 2012. (A similar survey was conducted in Haiti in 2011.)</td>
<td>Tanzania-681</td>
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</table>

**PROVIDER (NATIONAL SUPPLY–SIDE DATA)**

| The IMF, the IFC | Financial Access Survey | Global supply-side financial data (sourced from providers) on financial inclusion, encompassing internationally-comparable basic indicators of financial access and usage. | The FAS database contains annual data for 189 jurisdictions, including all G20 economies, covering an 11-year period (2004-2014), totalling 152 time series and 47 key indicators. From 2014, FAS includes indicators for mobile money. Coverage is of prudentially-regulated financial service providers only. | http://fas.imf.org/ |

<p>| The World Bank | Global Financial Development Database (GFDD) | Measures of (1) depth, (2) access, (3) efficiency, and (4) stability of financial systems. Each of these characteristics captures both (1) financial institutions (such as banks and insurance companies), and (2) financial markets (such as stock markets and bond markets). It also provides other useful indicators, such as measures of concentration and competition in the banking sector. (Sources: Uses latest available data from Bankscope, Bank for International Settlements, IMF’s International Financial Statistics, and World Bank’s World Development Indicators.) | 203 economies. Annual data, 1960-2011. The November2013 version of the dataset includes new data for 2011 and adds 37 new indicators relative to the April dataset. | Global Financial Development Database |</p>
<table>
<thead>
<tr>
<th>Organisation</th>
<th>Website/Publication name</th>
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<tr>
<td>The World Bank</td>
<td>The World Bank Global Payments Survey [Online report 2011]</td>
<td>A multi-country comprehensive survey carried out by the World Bank’s Payment Systems Development Group. Domestic payments, international remittances and regulatory information are covered, and mobile money is a part of this.</td>
<td>139 countries, 2010. The second iteration is adding a retail payments focus.</td>
<td><a href="http://hdl.handle.net/10986/12813">http://hdl.handle.net/10986/12813</a></td>
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<td><strong>G20 FINANCIAL INCLUSION INDICATORS (DEMAND AND SUPPLY-SIDE)</strong></td>
<td></td>
<td>Summary statistics use data from the most recent year available. The Global Findex and the IMF FAS indicator averages are from 2011, and the Global Payment Systems Survey indicator average is from 2009, and the Enterprise Survey average values are calculated using the most recent data for each country.</td>
<td><a href="http://www.gpfi.org/featured/g20-basic-set-financial-inclusion-indicators">http://www.gpfi.org/featured/g20-basic-set-financial-inclusion-indicators</a></td>
<td></td>
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<tr>
<td>GPFI (Global Partnership for Financial Inclusion)</td>
<td>The G20 Basic Set of Financial Inclusion Indicators (endorsed by G20 in Jun-12) [Downloadable data]</td>
<td>Methodology: G20 Basic Set of Financial Inclusion Indicators.pdf Developed by the GPFI’s Data and Measurement Subgroup and its Implementing Partners AFI, CGAP, IFC and the World Bank. The Basic Set includes indicators of access to, and usage of, financial services. (Sources: The Global Findex, the IMF FAS, the World Bank’s Global Payment Systems Survey, and the Enterprise Survey.) No mobile money data.</td>
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<tr>
<td>GPFI</td>
<td>The G20 Extended Set of Financial Inclusion Indicators (endorsed Sep-13) [Downloadable data]</td>
<td>Methodology: G20 Set of Financial Inclusion Indicators and core and second tier indicators: <a href="http://www.afi-global.org/library/publications/mobile-financial-services-indicators-measuring-access-and-usage-2013">http://www.afi-global.org/library/publications/mobile-financial-services-indicators-measuring-access-and-usage-2013</a> Developed by the GPFI’s Data and Measurement Subgroup and its Implementing Partners AFI, CGAP, IFC and the World Bank. The Extended Set includes indicators of access to, and usage of, and quality of service delivery (including financial literacy), financial services. One question on mobile money payments. (Sources: World Bank data sources are the Enterprise Surveys, the Global Financial Inclusion database (Global Findex), the Global Payment Systems Survey 2010, the Global Survey on Financial Consumer Protection and Financial Literacy, Financial Capability and Household Surveys; and Doing Business. Other data sources are the; the Gallup World Poll; International Monetary Fund’s (IMF) Financial Access Surveys (FAS) and both the SME Scoreboard 2012 and Measuring Financial Literacy survey of the Organization for Economic Co-operation and Development (OECD).)</td>
<td>Summary statistics use data from the most recent year available.</td>
<td><a href="http://datatopics.worldbank.org/g20/fidata/region/sub-saharan-africa">http://datatopics.worldbank.org/g20/fidata/region/sub-saharan-africa</a> or</td>
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<td>AFI (Alliance for Financial Inclusion) (a 2008 Bill and Melinda Gates)</td>
<td>AFI Core Set of Financial Inclusion Indicators on Access and Usage and Second Tier Indicators.</td>
<td>Core Indicators on Access and Usage. Second Tier Indicators include measurement and tools for barriers to access and usage, and the quality dimension of financial inclusion.</td>
<td>Member countries</td>
<td><a href="http://www.afi-global.org/policy-areas/measuring-financial-inclusion">http://www.afi-global.org/policy-areas/measuring-financial-inclusion</a></td>
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<td>Foundation - funded project; with AusAid</td>
<td>[Downloadable reports]</td>
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<td>CREDIT SCORES/RATINGS</td>
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<td>EXPERIAN</td>
<td>EXPERIAN Microanalytics</td>
<td>Calculate credit risk for each individual mobile money user using internal MNO data, combining mobile and mobile money usage, in an algorithm.</td>
<td>Commercial application</td>
<td><a href="http://www.e-microanalytics.com/mobile-money-plus/">http://www.e-microanalytics.com/mobile-money-plus/</a></td>
</tr>
<tr>
<td>The World Bank</td>
<td>Global Financial Development Report</td>
<td>Dataset provides information on credit reporting systems (credit registries – state-owned and credit bureaus- privately-owned commercial enterprises), building on the Doing Business Indicators database. Credit registry and credit bureau are dummy variables that take a value of 1 if a registry/bureau exists in a country and zero otherwise. In the sample, approximately 45% of countries have a credit registry and 55 percent have a credit bureau.</td>
<td>Latest date is 2010, for 195 countries around the world.</td>
<td>Credit Reporting Database</td>
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<td>NATIONAL CENTRAL BANK DATA ON MOBILE MONEY STATISTICS</td>
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<td>BANK OF KENYA</td>
<td>Statistical Bulletin</td>
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<td>MAPS</td>
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<td>(The MIX; &amp; MasterCard, Gates Foundation &amp; others)</td>
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<td>Fspmaps.com is funded by the Gates Foundation; &amp; Spatial Development International</td>
<td>Fspmaps.com</td>
<td>Geospatial information on financial access points by provider and distance; mobile network coverage; and high-resolution population data including poverty densities. Own data-sets can also be uploaded.</td>
<td>Data for Tanzania, Uganda, Nigeria and Bangladesh; will be adding Kenya and parts of Indonesia and India.</td>
<td>Fspmaps.com</td>
</tr>
</tbody>
</table>

Notes: These web addresses were last accessed in February 2015