

Information and communication technologies and rural youth

by
Jenny Aker

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Author:

Jenny Aker

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About the author

Jenny C. Aker is a professor of development economics at The Fletcher School of Law and Diplomacy and at the Department of Economics at Tufts University. She also serves as the director of the Fletcher Leadership Program in Financial Inclusion (FLPFI), the deputy director of the Hitachi Center for Technology and International Affairs and the co-director of the Center for International Environment and Resource Policy (CIERP), as well as a non-resident fellow at the Center for Global Development. After working for Catholic Relief Services in West and Central Africa, she completed her PhD in agricultural economics at the University of California-Berkeley. Her current work seeks to understand the impact of information technology on development outcomes in sub-Saharan Africa, particularly in the areas of agriculture, agricultural markets, adult education and financial inclusion. She is also working with NGOs to understand the barriers to (and impacts of) the adoption of agricultural and environmental technologies, as well as to design different mechanisms for providing social protection programmes.

Table of contents

1. Introduction	1
2. The challenges to youth employment	2
3. The potential for digital technology in youth employment	3
3.1 Digital coverage and adoption	3
3.2 The potential for digital technology in youth employment	4
4. Improving youth outcomes: practice and evidence	5
4.1 Traditional youth employment programmes	5
4.2 Digital initiatives	5
5. Issues for consideration	10
Tables and figures	12
References	15

Abstract

Despite the importance of rural youth for productivity, growth and development in lower- and middle-income countries, these populations have some of the highest rates of unemployment in the world. Rural youth face particular constraints in terms of labour market participation, including smaller social networks, low literacy rates, less work experience and limited access to capital (Robalino et al, 2013). Youth employment programmes have the potential to address these constraints, but they are often characterized by low enrolment, high dropout and uncertain returns. While the growth of digital technology offers new opportunities to address some of the issues associated with youth employment, research on their impacts is limited and results are mixed. We review existing research on the impact of digital initiatives on youth in the education, agriculture, financial and employment sectors, before proposing several ways forward for using digital technology to improve the impact of these programmes.

1. Introduction

The number of young people in developing countries has reached some of the highest levels in history (Lam, 2006; Das Gupta et al., 2014). While youth populations are at or near their peak in some regions – such as Latin America and East Africa – in other parts of Africa and South Asia it is estimated that youth populations will continue growing for several decades (Lam, 2006). According to the World Bank, youth account for approximately 60 per cent of unemployed people in sub-Saharan Africa, with 72 per cent of adolescents living below the poverty line (World Bank, 2009). In fact, the World Bank has argued that youth unemployment is one of the most “pressing social and economic problems facing developing countries” (World Bank, 2007).

Yet even beyond the potential issues of youth employment, in rural areas, young people are less likely to have access to land, inputs or capital (Robalino et al, 2013), and may work in occupations that have lower levels of productivity and little opportunity for growth and expansion. In addition, in many lower- and middle-income countries, rural youth are significantly underemployed, working only a few hours per week (Robalino et al, 2013).

How can developing economies better absorb younger populations, in either rural or urban areas? And how can youth be better prepared for the formal and informal labour markets in the agricultural and non-agricultural sectors? There are numerous constraints to youth employment in rural areas compared with adults, such as limited skills acquisition, smaller social networks, less work experience and limited access to capital. These factors are also influenced by broader macroeconomic factors, which, in turn, influence firms’ demand for youth labour (Robalino et al., 2013).

In order to address these constraints, a number of youth employment initiatives have been developed over the course of the past few decades. A majority of these programmes have focused on adult and vocational education, in the hopes of encouraging young adults to acquire marketable skills (Mbiti et al., 2016; Nishimura and Orodho, 1999). While rigorous research on these programmes is limited, existing evidence primarily focuses on Latin America, private vocational schools and urban areas (Bettinger et al., 2007; Card et al., 2011; Attanasio et al., 2011). Those programmes that do have rigorous evaluations are often characterized by low enrolment, high dropout, rapid skills depreciation and limited returns. This could be due, in part, to the limited relevance of these skills for the labour market, the high cost of these programmes and the inability to practise outside class (Aker et al., 2012).

The widespread growth of information technology, especially in remote rural areas of lower- and middle-income countries, offers new opportunities to address the particular constraints affecting youth. This is especially the case because youth are the key initial adopters of digital technologies, especially in urban areas. In particular, digital technology has the potential to increase youth’s access to public and private information, thereby improving their returns in agriculture; improve access to educational programmes, potentially improving skills acquisition; and improve access to financial services, especially through mobile money.

Over the past decade, numerous digital initiatives have been developed and disseminated by both the public and private sectors, with an estimated 400 initiatives deployed worldwide as of 2017 (Aker, 2017). While these initiatives span a variety of countries, sectors and digital technologies, the majority have been in the agriculture, education and health sectors (Aker, 2016, 2017). Although many of these initiatives have focused on rural areas, overall, a large percentage are not specifically focused on youth. Yet, despite the potential of information technology as a means of improving the effectiveness and efficiency of programmes targeting youth, there is

limited empirical evidence of their impact. Evidence that does exist suggests that their impact may be mixed, and not necessarily focused on youth populations or their labour market outcomes.

The rest of this paper proceeds as follows. We first review some of the specific challenges for youth in rural areas, specifically related to their employment in the agricultural and non-agricultural sectors. We then assess the ways in which digital technologies can overcome these market failures and discuss recent digital initiatives in the area of education, vocational training, financial services and agriculture, building upon recent reviews (Aker, 2017; Aker et al., 2016b). We then review existing research on the impact of digital initiatives on youth's skills acquisition, employment and access to finance, focusing primarily on the agriculture, education and financial service sectors. Finally, we close with a look at the gaps in the design and implementation of these initiatives, before providing suggestions for future research and policy.

2. The challenges to youth employment

It is widely recognized that youth, especially rural youth, face multiple constraints that affect their decision to enter the labour force, be fully employed and earn high returns to their labour, agricultural or otherwise (Robalino et al., 2013). These constraints are at the individual, firm and macroeconomic levels (Robalino et al., 2013). Robalino et al. (2013) outline a comprehensive framework identifying the individual- and macro-level constraints to youth employment, the particular market failures and the potential interventions to address these market failures.

At the individual level, rural youth are faced with numerous constraints compared with their adult counterparts. These include, but are not limited to, low levels of technical, cognitive and non-cognitive skills; smaller social networks; more limited access to information on potential jobs and wages, in part related to smaller social networks; constrained access to capital, especially capital that could be used for investment; and less work experience (Robalino et al., 2013). In addition, some youth may face additional constraints based on their gender, ethnicity, race or geographical location (World Bank, 2018).

While all of these characteristics are important, we focus on three in particular: skills acquisition, social networks and access to capital. For skills acquisition, it is estimated that 800 million adults worldwide are unable to read and write in any language (UNESCO, 2016). Of this total, youth seem to be disproportionately affected; according to a World Bank report, fewer than 10 per cent of youth have post-secondary education; in the Middle East, North Africa and sub-Saharan Africa in particular, 60 per cent of youth in the labour force have only primary education or less. These lower levels of skills acquisition may not only limit potential job opportunities and wages, but also reduce investment in agricultural activities that have higher returns (Robalino et al, 2013).

While limited skills acquisition affects adults and youth alike, adults may be able to compensate with more years of work experience and larger social networks. Youth, for example, often have smaller social networks, social networks that are more geographically limited, or social networks that have similar levels of education and experience. As a result, they may lack adequate information about job opportunities, and employers may not have enough information about the skills and behaviours of potential applicants (Robalino et al, 2013). This is further constrained when youth do not have formal education credentials or work experience; employers may not be willing to hire younger workers without sufficient experience, official credentials or references (Robalino et al, 2013).

Finally, while access to capital is a constraint for a most rural populations in developing countries, youth may be disproportionately affected. This is evident when looking at the Findex 2017 data for overall rates of access to formal financial services; youth populations (defined as those

between the ages of 15 and 24) have significantly lower access. This is for a variety of reasons. First, regulations in some countries limit access to capital for those below the age of 21, which constrains youth access to formal financial institutions. Second, fewer physical assets, smaller social networks and less access to collateral may further lower rates of financial inclusion among youth. Finally, banks may consider youth to be at high risk of non-repayment, so they may charge higher interest rates.

3. The potential for digital technology in youth employment

3.1 Digital coverage and adoption

Despite limited infrastructure investments in most of the developing world for much of the twentieth century, digital technology infrastructure – including the internet, mobile phones and other tools – has increased substantially since the turn of the century (Aker, 2017; World Bank, 2016). In particular, one type of digital technology – mobile phones – has expanded rapidly in Africa, Asia and Latin America, with over 70 per cent of the population of sub-Saharan Africa covered by mobile networks (GSMA, 2013; Aker 2017). This period has also coincided with a similar increase in mobile phone adoption and usage, both across and within developing countries. As noted in the World Development Report, “more households in developing countries own a mobile phone than have access to electricity or clean water, and nearly 70 percent of the bottom fifth of the population in developing countries own a mobile phone” (World Bank, 2016, p.2). While initial mobile phone adoption was among wealthier, more educated and urban users, more recently mobile phone adoption has spread across rural-urban and income divides (Aker and Mbiti, 2010).

Internet adoption, on the other hand, has been slower than mobile phones, in part because of the strength of telecommunication networks. That being said, the number of internet users has more than tripled over the past decade, estimated at 3.2 billion in 2015 (Aker, 2017). Yet there is still a wide disparity in adoption across and within countries (FAO, 2015). Across 19 emerging and developing economies, the median rate of smartphone ownership grew from 24 per cent in 2013 to 42 per cent in 2018 (Pew Research Center, 2018). Smartphone ownership is lowest in sub-Saharan Africa, where the median rate of ownership is 33 per cent, followed by the Asia-Pacific region (53 per cent) and Latin America (54 per cent). Within many lower-income countries, smartphone usage is primarily concentrated among urban, wealthier and more highly educated populations. On average, urban youth (aged 18-34) are more likely to own a smartphone than older generations (aged 35+) (Pew Research Center, 2016).

Finally, mobile money infrastructure has increased quite substantially over the past 10 years, with over 150 mobile money deployments worldwide (GSMA, 2017; Aker, 2017). Many of these have proliferated in East Africa, where over 90 per cent of the population uses mobile money in certain markets. While mobile money adoption rates are not available for youth in particular, existing research suggests that determinants of mobile money adoption are related to a user’s social network and their propensity to use a mobile phone (CGAP, 2017). Both of these would yield different predictions for adoption among younger populations; while smaller social networks would suggest that youth would be less likely to use mobile money, higher mobile phone ownership among youth would suggest the opposite. In Tanzania, for example, 61 per cent of youth reported having a good understanding of mobile technology, compared with 40 per cent of older generations (GSMA and GMEI, 2017), suggesting that there may be a higher propensity among

youth to use mobile money. However, age-specific data on adoption patterns are not available, so more general conclusions cannot be drawn.

3.2 The potential for digital technology in youth employment

Given lower rates of smartphone adoption in many developing countries – especially in rural areas – we primarily focus on mobile phone technology. Broadly speaking, mobile phones serve two functions. First and foremost, digital technology reduces the cost of communicating information. This, in turn, increases information-sharing within social networks, as well as information-sharing with the public and private sector (Aker and Mbiti, 2010; Aker, 2017). In theory, this could also increase the size of social and commercial networks, especially if obtaining contact information is not prohibitive (Dillon et al., 2018). Second, mobile money services can reduce the cost of transferring money compared with other mechanisms. This reduction in transaction costs can allow individuals to transfer money when and where they need it (Jack and Suri, 2014; Aker et al., 2013; Blumenstock et al., 2014), thereby increasing the frequency and amount of transfers and providing access to other financial services.

Information asymmetries

For youth in remote rural areas, information technology can be used to directly address some of the market failures that they face. From an educational perspective, information technology can potentially reduce the cost of disseminating training and education programmes, thereby increasing their outreach and scope in remote rural areas. In addition, this technology can be used to allow youth to practise the skills that they have learned out of class, perhaps increasing the relevance and sustainability of such skills. And finally, information technology could potentially be used as a monitoring and pedagogical device for public and private service providers of such programmes.

Beyond these potential uses, information technology could also reduce the cost of getting access to information – on agricultural inputs, outputs and techniques, job opportunities or other contacts. In the agricultural sector, this could allow younger populations to adopt new technologies and obtain lower input prices and higher output prices, thereby increasing their returns from agricultural investments. In the area of employment, information technology could potentially help youth to find jobs more quickly, make better decisions about where to migrate or find higher-paying jobs. This information-sharing could also potentially strengthen the ties between existing social networks or allow youth to increase the size of their social networks.

On the firm side, information technology could potentially allow firms to advertise job openings more easily, or alternatively receive information about a potential applicant, thereby overcoming a key asymmetry between firms and applicants. This could be done by posting jobs via mobile phones, as well as asking for feedback on younger applicants who do not have a work history or education credentials. This could allow firms to increase their outreach when they are recruiting, and receive more information about potential applicants, therefore reducing the moral hazard and adverse selection problem.

On the government side, digital technology offers the potential to collect and disseminate data more quickly and more cheaply on youth, their employment status and wages. This data collection could, in turn, affect youth's ability to identify areas of high employment and low wages, and perhaps better target government interventions.

Money transfers and access to finance

From a transfer perspective, mobile money – including recent advances in digital financial services, such as digital savings and digital credit – could potentially be used to address the constraints that youth face in the areas of financial services. First, the reduction in transfer costs associated with mobile money could increase the frequency and amount of remittances, thereby increasing incomes directly or indirectly. Second, mobile phone and mobile money usage can be potentially used as a means of creating a digital credit score, thereby increasing youth access to credit; this has been introduced in countries such as Kenya and Uganda, with anecdotal evidence suggesting that urban youth have been some of the first adopters. Third, on the firm side, mobile money could potentially allow employers to pay employees directly with mobile money, thereby reducing the transaction costs associated with salary payments

4. Improving youth outcomes: practice and evidence

4.1 Traditional youth employment programmes

Over the past decade, there has been significant investment in initiatives attempting to address the market failures that affect youth employment in the agricultural and non-agricultural sectors. In 2013, the World Bank estimated that there were 500 “youth employment” programmes worldwide across 100 countries. Many of these programmes have focused on the constraints to youth employment at the individual, firm and macro levels in five key areas: (1) skills training for youth (i.e. vocational training and basic adult education programmes); (2) entrepreneurial assistance for youth, including financial assistance and training in agricultural and non-agricultural entrepreneurship; (3) subsidized employment schemes for youth and firms; (4) job information services for youth and firms; and (5) changes to labour market regulations. Of these areas, a majority of these programmes focus on skills and entrepreneurial training, although in many cases they do not incorporate digital technology. Two of the key exceptions are the creation of digital job service platforms (Robalino et al, 2013) and some of the programmes in the World Bank public-private partnership for youth employment (World Bank, 2018).

Despite the proliferation of these programmes, there is relatively little rigorous evidence about their impact (Robalino et al, 2013). As of 2013, the World Bank had estimated that only 20 per cent of programmes had conducted impact evaluations; among those that were evaluated, the evidence was mixed on youth’s skills acquisition in the agricultural and non-agricultural sectors, employment, agricultural outcomes, wages and income (Robalino et al, 2013).

4.2 Digital initiatives

Parallel to the growth in youth employment programmes, a number of digital “development” programmes have been developed worldwide (GSMA, various years; Aker, 2017). These are public- and private-sector programmes that use digital technology to disseminate information, provide training or distribute transfers. The programmes have spanned a variety of sectors that are directly and indirectly related to youth education and employment, such as agriculture, adult education and vocational training, financial services and social protection. In addition, they use a variety of digital technologies, from mobile phones to computers and from smartcards to the internet. Nevertheless, a majority of these initiatives use simple mobile phone technology, primarily voice and short message service (SMS). Many of these programmes also address general market failures in rural areas, and are not necessarily focused on youth. A survey of digital initiatives in a variety of sectors, especially in agriculture, are available in Aker and Mbiti (2010), Aker and Blumenstock (2014), Aker et al. (2016a) and Aker (2017).

Despite the proliferation of digital initiatives, few programmes have been rigorously evaluated (in general) and even fewer have assessed the specific impact upon younger populations. As of 2017, approximately 10 per cent of these programmes involved rigorous research. Those with impact evaluations have primarily focused on the education and agriculture sectors, with a geographical focus on Asia (Aker 2017).

In an effort to better understand how digital initiatives have affected youth outcomes, we will outline some of the existing digital initiatives in the areas of skills acquisition (adult education and vocational training), agriculture, financial services and social protection. Of these, we primarily focus on research involving impact evaluations, summarizing the existing evidence on the study population. In those areas where data on age groups are provided, we also conduct subgroup analysis of the impacts of the programme on youth (aged 15-35) compared with older populations, regardless of whether or not the initial programme design was stratified by age.

Digital adult education and vocational training

Digital technology has primarily been used for one of two purposes in education: as a pedagogical tool and as a monitoring tool. Yet, traditionally, the use of digital technology as an educational device has focused on computers and laptops for primary children, rather than youth or adults.¹

Focusing on mobile phones as a pedagogical tool, Aker et al. (2012) conducted a randomized evaluation of a digital adult education programme in Niger, where a mobile phone-based component (“ABC”) was added to an otherwise standard adult education programme. The target population of the programme was any illiterate individual in rural areas between the ages of 15 and 65, with approximately half of the population under the age of 35. Overall, the mobile phone technology substantially improved adults’ learning outcomes: across the entire study population, regardless of age, adults’ writing and maths test scores were 0.19–0.25 standard deviations (s.d.) higher in the villages that had received mobile phone education immediately after the programme, with a statistically significant effect (Aker et al., 2012). While these skills depreciated in both groups after the programme, the relative improvements in ABC villages persisted over time (Aker and Ksoll, 2018). In addition, the programme had impacts on well-being in the medium term: students in ABC villages had more assets and lower levels of food insecurity and were more likely to save three years after the programme.

As is evident in figure 1, the mobile phone-based adult education programme in Niger was equally effective for younger (under 35) and older populations. On average, adult learners in the ABC programme improved their test scores by a similar magnitude compared with the standard adult education programme, regardless of age (figure 1). The results were similar when assessing the impact of the ABC programme on adults’ savings, food security and income by age: overall, the ABC programme had similar impacts, regardless of the beneficiary’s age (not shown).² The one area where there was a difference was asset ownership: on average, younger learners in ABC villages had more assets than older learners, but this was primarily driven by higher mobile phone ownership and usage in this age group. This suggests that the initial ABC programme may have spurred younger students to purchase and use mobile phones, but there were no other differential effects on learning and welfare.

In the area of vocational training, Cole and Schoar (forthcoming) conducted a randomized evaluation of a mobile phone-based vocational training programme that delivered simplified financial lessons

¹ Those studies that use computers as an educational tool find either positive (Banerjee et al., 2007; Linden, 2008; Lai et al., 2011; Yang et al., 2013; Mo et al., 2014) or no effects (Barrera-Osorio and Linden, 2009; Beuermann et al., 2013). However, few of them measure effects in the longer term.

² Using the data from the Aker and Ksoll (2018) paper, we estimated the specification $y = \gamma + \alpha ABC_i + \beta young_i + \delta ABC * young + \theta + u_{it}$ to estimate the differential effect of the programme on younger and older populations. In this case, the coefficient on the interaction term yielded no differential effects of the programme for most outcomes, with the exceptions of “assets”, as explained in the text.

through interactive voice response system (IVRS) and SMS to microentrepreneurs in India, without a specific focus on youth. The study found that fewer than 50 per cent of participants listened to the messages, suggesting that compliance was low. Nevertheless, among those who listened to more than half of the messages, entrepreneurs were more likely to increase their business sales and less likely to withdraw cash from their enterprises for personal reasons.³ Heterogeneity analyses by age bracket were not conducted, and therefore it is difficult to conclude whether the programme was more effective for younger entrepreneurs.

Beyond the provision of educational content via digital technology, mobile phones have also been used in the context of monitoring education service providers. While there are a number of studies using information technology for school-aged children (e.g. Duflo et al., 2011; Cilliers et al., 2018), there are fewer studies on vocational or adult education programmes. In Niger, Aker et al. (forthcoming) conducted a randomized control trial (RCT) that used mobile phones to call teachers and other stakeholders in an adult education programme, which targeted all adults over the age of 15. Overall, the additional phone calls increased students' learning outcomes by an additional 0.12-0.15 s.d. compared with the standard adult education programme. Nevertheless, similarly to the ABC programme, there were no differential impacts of the programme by age bracket.

Overall, existing evidence on the use of digital technology in vocational training and adult education programmes suggests that such programmes can be useful in improving adults' learning outcomes, as well as a modest number of welfare measures. Nevertheless, the use of digital technology does not seem to especially favour youth, as outcomes are similar for younger and older students.

Digital agriculture⁴

It has widely been recognized that mobile phone networks can potentially improve farmers' and traders' access to information, arbitrage behaviour and market performance. Given that youth often have smaller social networks, less experience and less education, access to information can be more limited for younger populations, and hence digital technology could potentially have larger impacts for younger farmers. Several studies have found that increased access to mobile phone coverage is associated with greater efficiency of agricultural markets (Jensen, 2007; Aker, 2010; Mittal et al., 2010; Aker and Fafchamps, 2015), primarily because market actors are able to engage in spatial arbitrage.

While reductions in price dispersion suggest more efficient markets, the distribution of those welfare gains among consumers, producers, traders, and younger and older populations is ambiguous. Jensen (2007) finds an increase in producers' prices and profits, whereas others have found little to no effect on farmgate prices (Aker and Fafchamps, 2015; Mitra et al., 2012; Futch and McIntosh, 2009). To date, none of these studies has focused on the impact of mobile phone networks on younger populations or conducted heterogeneity analyses by age. In theory, mobile phone networks could potentially serve as a substitute for youth's smaller social networks; however, if mobile phone networks are a complement to these social networks, then a strong social network is required in order for mobile phones to benefit younger populations in the area of agriculture.

Dillon, Aker and Blumenstock (2018) attempt to address the complementarity between mobile phones and social networks by conducting an RCT of a mobile phone directory for firms in Tanzania. After conducting a census of all firms in a geographical area, they printed the directory and distributed it to a subset of villages, with 50 recipients per village, regardless of age. On the trader side, the authors find that traders are more likely to receive more calls and to adopt other mobile phone-based payment technologies; on the farmer side, the authors find that households assigned to the directory have more

³ In a similar intervention, Making Cents International's Rural Youth Economic Empowerment programme provides rural youth with entrepreneurship skills and microfinance services in Tunisia, Yemen, Morocco and Egypt through mobile-based financial tools.

⁴ A significant portion of the text from this report draws upon Aker et al's (2016) work and Aker (2017).

mobile phone contacts and are more likely to use their phones to conduct business (Dillon et al., 2018). The study did not assess the impact of the intervention by age, making it difficult to know whether or not the directory was a complement to or substitute for social networks for those with smaller social networks.

Beyond the impact of the growth of mobile phone coverage and other mobile phone services, there has been a proliferation of digital agriculture initiatives over the past decade (Aker, 2017; Aker et al., 2016). As of 2016, there were over 130 digital agriculture initiatives worldwide, provided by the public and private sectors (Aker et al., 2016). Digital technology in the agricultural sector has primarily been used in three ways: (1) to provide information to farmers about agricultural techniques, prices or weather; (2) to provide agricultural extension advice; and (3) to monitor agricultural extension agents. Overall, studies on digital agriculture initiatives suggest that such services increase farmers' knowledge in particular areas – prices, cropping systems, etc. – but have mixed impacts on agricultural practices, production or farmgate prices.

In the area of information provision, there is a significant body of research in sub-Saharan Africa, India and Latin America. In Uganda, an RCT of a radio price information programme found that the intervention increased farmers' farmgate prices and the amount of maize sold (Svensson and Yanagizawa, 2009). Nevertheless, other studies on the impact of digital price and weather information were mixed: while two studies found that these programmes increased the prices that farmers received, others found no effects (Courtois and Subervie, 2015; Hildebrant et al., 2014; Nakasone, 2013; Mitra et al., 2012; Camacho and Conover, 2011; Fafchamps and Minten, 2012). A hybrid programme of price information and quality testing at internet kiosks in India had a positive effect on soybean prices and production (Goyal, 2010).

In the area of agricultural extension, an RCT in India found that a call-in hotline that provided agricultural advice encouraged farmers to invest more in recommended agricultural inputs and increased cumin and cotton yields (Cole and Fernando, 2016). In Kenya, an RCT that provided extension information by SMS to sugar cane farmers increased sugar cane yields, but these results did not persist (Casaburi et al., 2016).

In the area of monitoring, Jones and Kondylis (2014) used an RCT in Rwanda to test different feedback mechanisms on agricultural extension providers. While both in-person and digital monitoring interventions were equally effective, the digital services were substantially cheaper, suggesting they were more cost-effective.

Despite the number of studies, few of these programmes specifically target youth, and none of the research papers conducted heterogeneity analyses by age. While it is possible that such programmes could be more beneficial for youth, especially if they are more educated and more likely to adopt new agricultural technologies, there could be important complementarities between information technology, age and experience, which would disadvantage younger populations with smaller social networks.

Digital financial services

Digital technology has primarily been used for three purposes in the area of financial services: (1) private money transfers and other digital financial services; (2) public money transfers for salary and welfare payments; and (3) SMS reminders, reminding individuals and households how to save or invest.

Private transfers

With the widespread growth of mobile money (m-money) over the course of the past decade, access to financial services via digital technology offers significant opportunities for offering financial services to rural youth. As a money transfer service, mobile money can significantly reduce the cost of

transferring money in comparison with other means (Aker and Mbiti, 2010; Aker and Blumenstock, 2014). More recently, mobile phone operators have modified the basic mobile money product – which is a transfer service – to offer other services via the mobile money platform, such as digital savings and digital credit.

Jack and Suri (2014) showed that Kenyan households with access to m-money agents are able to smooth consumption in the face of idiosyncratic shocks, primarily thanks to increased remittances from migrants. They also find that those with access to mobile money were lifted out of poverty, primarily by increasing access to financial services (Jack and Suri, 2016). In Rwanda, Blumenstock, Eagle and Faichamps (2016) showed that m-money facilitated person-to-person transfers in response to negative shocks. None of these studies specifically focused on the impact of mobile money on younger populations.

More recently, the basic mobile money product has been modified to provide access to other financial services, such as savings and credit. Habyarimana and Jack (2018) evaluated the impact of ‘High Hopes’, a mobile-money-administered commitment savings account programme in Kenya, which was aimed at Kenyan high school students. The programme sought to incentivize students to meet their educational savings goals. They found that there was a threefold increase in participants’ financial savings, and parents who had saved were 18-24 percentage points more likely to enrol their children in high school. While these students are at the lower end of the youth spectrum, the results are promising in suggesting that digital technology could offer youth an alternative place to save.

More recently, Bharadwaj et al. (2018) estimated the impact of a digital credit product on Kenyan consumers. While take-up of the product was high, the impact on savings, investment and income was negligible, suggesting that the product may not be overcoming market failures in demand for investment credit.

Public transfers and private-sector payments

With the potential reduction in transaction costs associated with m-money, there has been growing interest in using m-money for public transfers and salary payments. In the area of social protection, Aker et al. (2016) found that using m-money in the context of an unconditional cash transfer programme in Niger reduced the implementing agency’s variable costs of distributing those transfers, and reduced programme recipients’ costs of obtaining those transfers. Those programme recipients who received the transfer using m-money also used the transfer to purchase more diverse types of food items and had higher diet diversity (Aker et al., 2016).⁵ While the original study did not conduct the analysis by age, a supplemental subgroup analysis shows that the results are similar for younger (aged 15-34) and older populations. Figure 2 shows the difference by age category for the primary outcome of the study, household diet diversity. On average, younger and older recipients who were assigned to the mobile money cash transfer had higher levels of diet diversity than those who were assigned to the cash payments, but there were no differential effects by age.

In the context of salary payments, Blumenstock, Callen and Ghani (2015) found that m-money can provide significant cost savings to firms, especially in contexts with limited access to formal banking institutions. Using an RCT in Afghanistan, they found that the firm significantly reduced its costs of paying employees, but only in areas where adequate coverage existed for both the mobile network and m-money agents. The study did not estimate the impacts for younger populations.

⁵ Outside the scope of mobile money, Muralidharan et al. (2016) measure the impact of a biometric smartcard on beneficiaries of employment (NREGS) and pension (SSP) programmes in India, finding that the new system delivered a faster, more predictable and less corrupt NREGS payments process without adversely affecting programme access.

Similarly to other sectors, few of these programmes specifically targeted youth – with the exception of the digital savings programme in Kenya – and none conducted heterogeneity analyses by age. While it is possible that such programmes could be more beneficial for youth, especially if they offer alternative access to financial services, there could be important complementarities between mobile money, age and social networks.

Youth employment and job-matching services

In the area of job matching and job creation, digital technology could be used to match employers with potential employees, thereby broadening the outreach to youth and clients in low-income settings with low capacity and infrastructure. In particular, internet, radio or SMS messaging may provide an opportunity to offer employment services across larger areas. An SMS-based job-matching application has been introduced in Palestine, Morocco and East Africa, providing job information through an SMS platform. To date, there is no rigorous evidence on the impact of the provision of these services on adoption, usage, employment and wages.⁶

Beyond matching employers to potential employees, several skills development projects are using social media to make the job-matching process more accessible and efficient for young people. For example, Youth Building the Future (YBF), a skills development project in Colombia, is using Facebook to inform its beneficiaries about job postings, career fairs and scholarships. YBF is also using Facebook to manage its alumni groups to build a continuing online community of its programme alumni. Harambee, a youth employment accelerator programme that aims to provide South African youth with employable skills, has partnered with LinkedIn to design a curriculum to train its beneficiaries in using LinkedIn and other digital platforms for searching for jobs.

5. Issues for consideration

While there is potential for information technology for youth in rural areas, there are also constraints on the use of it to target and implement youth-based programmes. The first is the type of digital technology being used, including the existing infrastructure, the technology itself (i.e. computer, smartphone, mobile phone), the platform (SMS, voice, USSD) and the interfaces. While smartphones offer new opportunities in many countries, they also add new challenges (and costs), and are not yet widely adopted in most rural areas (Aker et al., 2016). Simple mobile phones are widely used, but SMS holds limited information and requires some literacy, which may disadvantage youth who cannot read or write.

A key assumption of using digital technology is that it will help to overcome some of the key market failures for rural youth: lower skills, smaller social networks, less experience and limited access to job or agricultural information. While this is a relevant assumption in most contexts, digital technology will be successful in increasing knowledge, changing behaviour and improving outcomes only if a number of necessary conditions exist at the individual, firm and market levels. In other words, information must be a real constraint that needs to be addressed.

Even if digital technology addresses the key market failures, rural youth still need access to other public goods and financial services in order to translate that information into improved employment outcomes in the agricultural and non-agricultural sectors. For example, the limited availability of timely and affordable credit remains a major constraint that can realistically limit farmers' and small

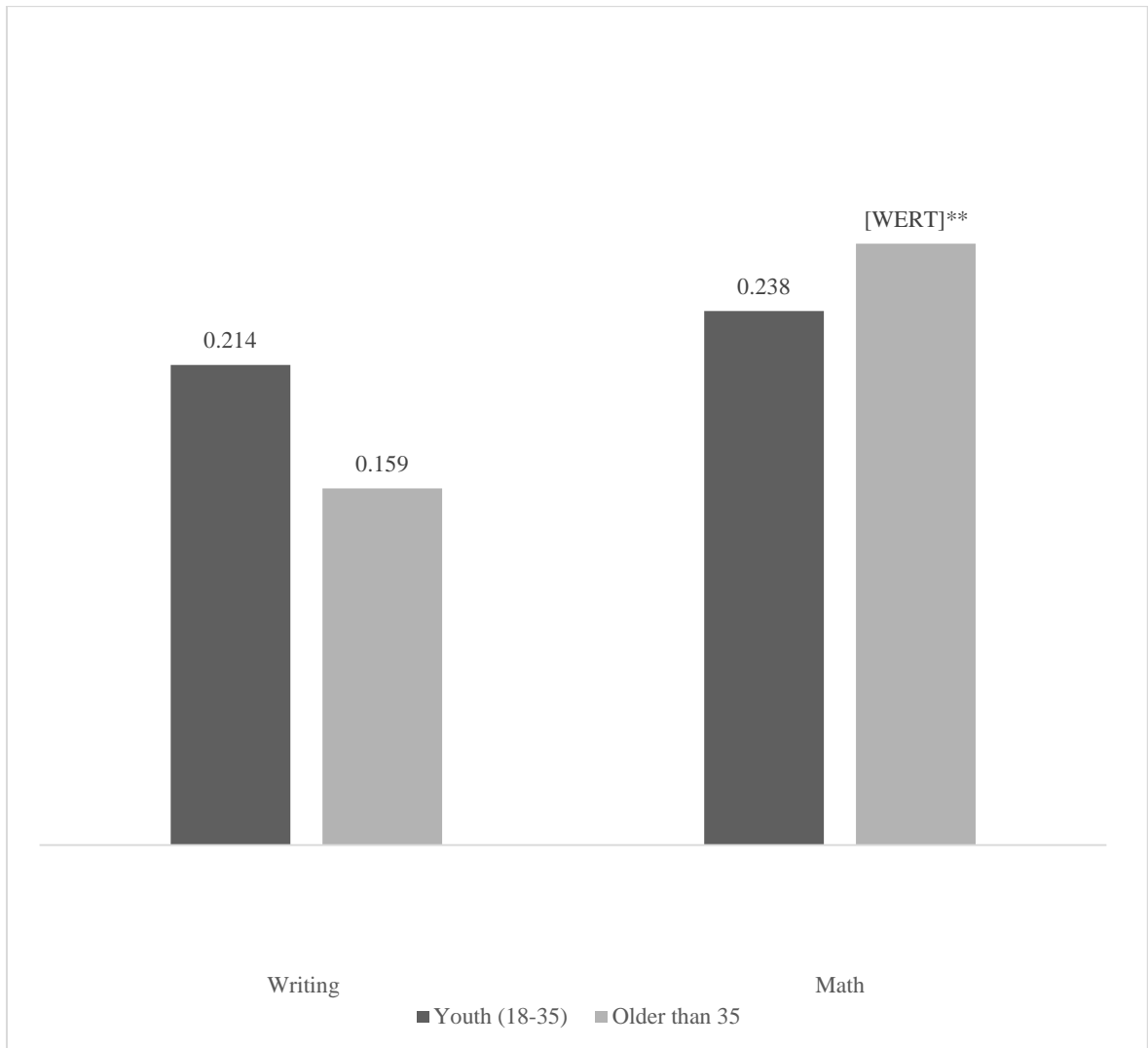
⁶ Similarly, Tounes Ta3mal provides employment intermediation services, skills development and entrepreneurship training to Tunisian youth through mobile phones. The main focus of the programme is on vulnerable Tunisian rural youth aged 18-30. A majority of the programme services, such as online courses, a job-matching search engine and psychometric tools, can be accessed by the beneficiaries through an online portal on a mobile phone.

businesses' capacity to meaningfully use any information provided (Srinivasan and Burrell, 2013; Casaburi and Reed, 2014). Alternatively, if youth obtain price information, but there are no roads connecting the village to the market or they have more limited bargaining power vis-à-vis traders, then the impact of the digital agricultural information will be limited.

Finally, while over 500 youth programmes and 400 digital deployments exist worldwide – with 130 of them in agriculture alone – the link between “youth” and digital technology is not always explicit. In particular, impact evaluations of youth employment programmes are rare, making it difficult to know what works (and what does not), and if digital technology can be useful. In addition, only 10 per cent of digital technology deployments are rigorously researched, and most of these studies do not include heterogeneous analyses by different age groups, making it difficult to know if the given programmes are more (or less) beneficial for youth (table 1). Given that age is a key demographic variable collected in most studies, this limitation seems as if it would be an easy constraint to overcome.

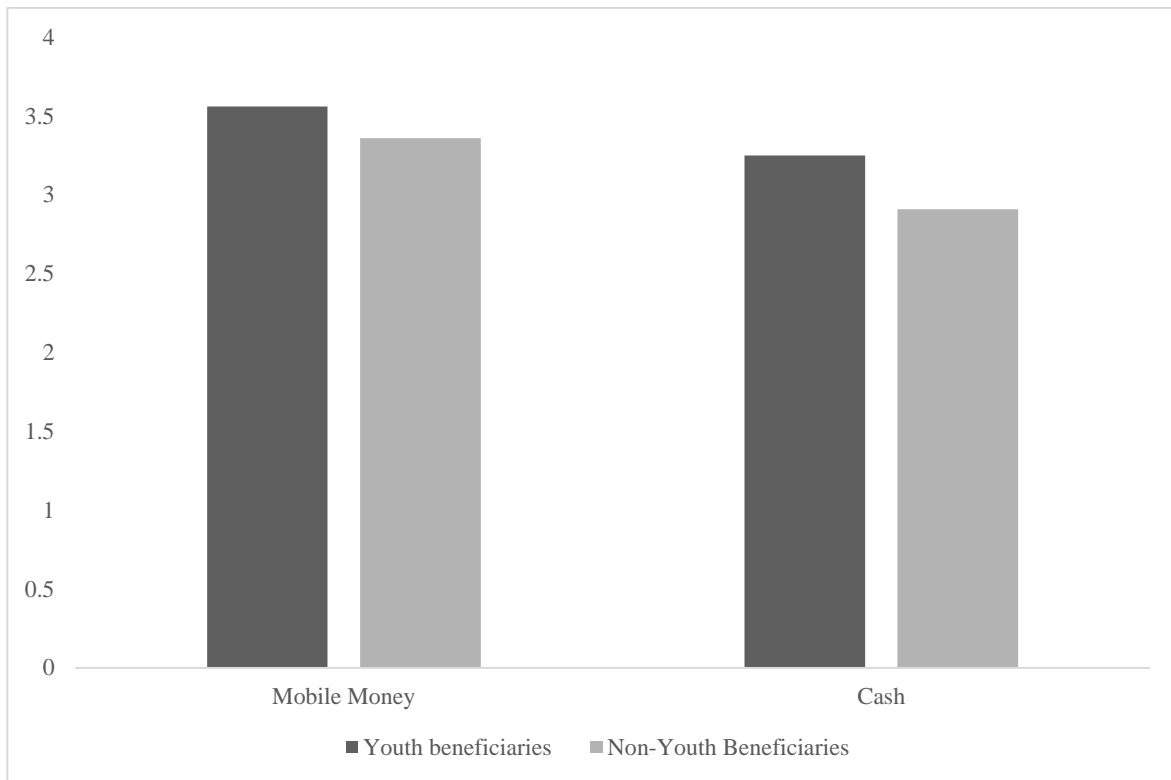
Tables and figures

Figure 1. Impact of the ABC programme on writing and maths z-scores by age



Notes: This figure shows the average standardized writing and math test scores for students in the ABC programme (Alphabetisation de Base par Cellulaire) compared with those not in the ABC programme. ** signifies statistically significant at the 5 percent level.

Figure 2. Impact of mobile money cash transfers in Niger by age



Notes: This figure shows the average household diet diversity score (HDDS) for youths (defined as 15-34) and non-youths (older than 34) for those in the mobile money cash transfer programme and the manual cash transfer programme.

Table 1. List of digital development impact evaluations and focus on youth

Study	Sector	Analysis by youth
Aker et al. (2012), Can mobile phones improve learning? Evidence from a field experiment in Niger	Adult education	Y
Aker et al. (2015), Learning without teachers? Evidence from a randomized experiment of a mobile phone-based adult education programme in Los Angeles	Adult education (pedagogy)	N
Aker and Ksoll (2018), Can ABC lead to sustained 123? The medium-term effects of a technology-enhanced adult education programme	Adult education (pedagogy)	N
Aker and Ksoll (forthcoming), Call me educated: Evidence from a mobile monitoring experiment in Niger	Adult education (teacher monitoring)	N
Duflo et al. (2012), Incentives work: Getting teachers to come to school	Education (teacher monitoring)	N
Cilliers et al. (2018), Pay for locally monitored performance? A welfare analysis for teacher attendance in Ugandan primary schools	Education (teacher monitoring)	N
Cole and Scoar (forthcoming), Rules of thumb: Providing timely financial management advice at scale in India	Vocational training	N
Jack and Suri (2014), Risk sharing and transactions costs: Evidence from Kenya's mobile money revolution	Financial services (mobile money)	N
Jack and Suri (2016), The long-run poverty and gender impacts of mobile money	Financial services (mobile money)	N
Habyarimana and Jack (2018), High hopes: Experimental evidence on saving and the transition to high school in Kenya	Financial services (commitment savings account)	N
Aker et al. (2016), Payment mechanisms and antipoverty programs: Evidence from a mobile money cash transfer experiment in Niger	Social protection	N
Muralidharan et al. (2016), Building state capacity: Evidence from biometric smartcards in India	Social protection	N
Banerjee et al. (2016), E-governance, accountability, and leakage in public programs: Experimental evidence from a financial management reform in India	Social protection	N
Jensen (2017), The digital provide: Information (technology), market performance, and welfare in the south Indian fisheries sector	Agriculture	N
Aker (2010), Information from markets near and far: Mobile phones and agricultural markets in Niger	Agriculture	N
Aker and Fafchamps (2015), Mobile phone coverage and producer markets: Evidence from West Africa	Agriculture	N
Mitra et al. (2012), Asymmetric information and middleman margins: An experiment with West Bengal potato farmers	Agriculture	N
Futch and McIntosh (2009), Tracking the introduction of the village phone product in Rwanda	Agriculture	N
Muto and Yamano (2009), The impact of mobile phone coverage expansion on market participation: Panel data evidence from Uganda	Agriculture	Y

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