

# Mobile money, child labour and school enrolment

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## ABSTRACT

This paper analyses the impact of household adoption of mobile money services on child labour and schooling in Tanzania. The paper uses data drawn from the Tanzania National Panel Surveys (TNPS), for the survey periods as follows: 2008/09, 2010/11, 2012/13, and 2014/15. The TNPS are national representative surveys conducted by the National Bureau of Statistics of Tanzania in collaboration with the World Bank Living Standards Measurement Study-Integrated Surveys on Agriculture (LMSA-ISA). The surveys collect detailed information on individual, household, and community-level characteristics. The panel nature of the TNPS allows for the same households to be interviewed over time. The study uses a difference-in-differences approach, and instrumental variables strategy to investigate the nexus between mobile money adoption and child labour and school enrolment in Tanzania. The findings of this study reveal a positive and significant effect of mobile money adoption on school enrolment, but a negative effect on children's labour market activities. Moreover, the study identifies heterogeneous impacts across child's gender and age; and remittances receipt and education expenditure are the potential pathways through which mobile money adoption affects child labour and school enrolment. Overall, the results suggest that policies that enhance financial inclusion such as the introduction of mobile money can be effective in improving child's school enrolment and a decline in the incidence of child labour.

## 1. Introduction

Many a poor household engage children in child labour related activities as a means of raising income to mitigate the impact of poverty on households (Basu & Van, 1998; Krauss, 2017; Ray, 2002). A few studies reveal a positive association between informal risk sharing and child labour and low school enrolment, especially in the context of developing countries (Dehejia, & Gatti, 2006).<sup>1</sup> Households affected by adverse income shocks due to exposure to drought, flood, loss of employment, loss of farmland, pest invasion on farm, economic or financial crisis, and death or illness of family head often resort to the use of informal risk sharing mechanisms

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<sup>1</sup> Child labour is associated with work that deprives children of their childhood, their potential and their dignity, and that is harmful to physical and mental development. Moreover, child labour deprives children the opportunity to attend school or requiring children to combine school attendance with excessively long and heavy work or activities. Child labour could have consequences for children by affecting their mental, physical, and social or moral development (ILO, 2017a; ILO, 2017b).

such as child labour and withdrawal of children from school as buffers against negative income shocks (Ajefu, 2017; Dehejia and Gatti, 2002; Dercon, 2002; Fafchamps, 1999; Portner, 2001).

Considering the above, mobile money adoption is likely to have implications on child labour and school enrolment based on its poverty-reducing effect on households as well as risk-sharing and relaxing of credit constraints through the receipt of remittances (Jack & Suri, 2014, 2016). The expansion in access to mobile phones in sub-Saharan Africa, among many of its benefits, led to the introduction of mobile money services, which has boosted financial inclusion of the unbanked poor households previously inhibited by poor infrastructure and high transaction costs across the region.<sup>2</sup> Mobile money services provide the platform that allows individuals and households to send or receive money cheaply, quickly, and safely around the country using mobile phones. The introduction of mobile money services can have significant effect in facilitating the sending and receiving of remittances (Jack & Suri, 2011, 2016; Munyegera & Matsumoto, 2016; Riley, 2018). A growing number of studies reveals that the benefits associated with the use of mobile money services include facilitating of savings and borrowings, empowering the poor to smooth consumption and insuring households against negative income shocks (Munyegera & Matsumoto, 2016; Riley, 2018).

Despite the growing interests in the poverty-reducing effects of mobile money adoption, there has been limited evidence on the relationship between mobile money and child labour and school enrolment as well as the pathways through which mobile money affect child labour and school enrolment in the context of developing countries. Therefore, the motivation of this paper stems from theoretical and empirical evidence on the incidence of child labour and children's low school enrolment in developing countries being associated with poverty of households and credit market imperfections (Baland & Robinson, 2000; Bandara, Dehejia, & Lavie-Rouse, 2015; Basu & Van, 1998; Beegle et al., 2006; Fatma, 2019; Meltem, 2006; Ranjan, 2001).

This paper examines the effect of households' adoption of mobile money on child labour and school enrolment in Tanzania, using data obtained from the Tanzania National Panel Survey (TNPS). Moreover, using mediation analysis, the study identifies remittance receipts and education expenditure as potential channels through which household mobile money adoption affects child labour and school enrolment. The objective of this paper is twofold: Firstly, to investigate the impact of mobile money on child labour and school enrolment in Tanzania. Secondly, to investigate the potential channels through which mobile money adoption affect child labour and school enrolment. The paper considers the following hypotheses. (i) mobile money adoption has a positive effect on school enrolment. (ii) mobile money adoption has a negative effect on child labour. (iii) Remittance receipts and education expenditure are the channels through which mobile money affect child labour and school enrolment.

This paper focuses on Tanzania because it provides a compelling context to investigate the impact of mobile money on child labour and school enrolment given the spate of child labour and the growth of mobile money services in recent years in Tanzania. Moreover, Tanzania has witnessed a significant increase in the use of mobile money across its population since it was introduced in 2009. As of March 2018, there were six mobile money service providers in the market: Vodacom's M-Pesa, Tigo Pesa, Airtel Money, Ezy Pesa, Halotel Money, and TTCL (Tanzania invest, 2019). In 2015, almost a third of active mobile money accounts in East Africa were in Tanzania. Reports reveal that registered mobile money accounts grew from 44% in 2013 to 61% in 2015 (CGAP, 2016). Another motivation for focussing on Tanzania stems from Tanzania being one of the early adopters of mobile money services in sub-Saharan Africa, which has witnessed the growth of mobile money services in the country over time (Aron, 2017).<sup>3</sup> Specifically, mobile money was first introduced in sub-Saharan Africa in Kenya before it spreads to Tanzania and Uganda. Kenya accounts for the world's highest share of adults with a mobile account, account for 58%, followed by Somalia, Tanzania, and Uganda, each account for about 35% (Demirguc-Kunt, Klapper, Singer, & Van Oudheusden, 2015). The proximity of Tanzania to Kenya, where mobile money was first introduced, also contributed to the growth in the adoption of mobile money services in Tanzania. Hence, Tanzania is currently catching-up with its neighbour in terms of the number of users and the volume of mobile money transactions (CGAP, 2016).

Considering child labour and school enrolment in Tanzania, which is the focus of this paper, child labour is a pervasive phenomenon and children are engaged in hazardous tasks such as fishing, mining, quarrying, and domestic work. Some of these hazardous tasks are described as worst forms of child labour for children aged 5 to 14. It can be considered as a fairly "average" country for sub-Saharan Africa. According to UNICEF (and following the ILO definition of child labour), 29% of children between the age of 5–14 provide labour, as against 28% for all Sub-Saharan Africa and 26% for Eastern and Southern African countries and estimated 29.3% (3.5 million) for Tanzania<sup>4</sup> (UCW, 2010). Evidence has shown that child labour could have deleterious effects on physical health, mental well-being, and crowding out of leisure of children. It could also lead to a reduction in human capital accumulation, which are associated with deleterious consequences on labour market prospects in future (Akabayashi & Psacharopoulos, 1999; Baland & Robinson, 2000; Fallon & Tzannatos, 1998; Ranjan, 2001; Ravallion & Wodon, 2000, pp. 158–175; Sara & Giannelli, 2020). For instance, in Tanzania, which is the focus of this study, about 20% of working children reported that their labour activities prevented them from learning correctly, and 20% have already suffered a work-related injury (Dumas, 2020).

To curb incidence of child labour, many developing countries have designed policies or legislations to reduce child labour and boost

<sup>2</sup> The expansion of mobile money in sub-Saharan Africa is largely due to limited access to physical presence of banks and traditional financial services. The earliest mobile money services began in Kenya, followed by Uganda and Tanzania. One of the earliest and most successful mobile money service providers is M-Pesa in Kenya, which launched its service in 2007 (Jack & Suri, 2011).

<sup>3</sup> According to Finscope (2018), access to and usage of financial services in Tanzania increases from 58% in 2013 to 65% in 2018. The growth in financial access has been remarkable when compared to 2012 when the World Bank estimates show that only 17 percent of individuals of 15 years and older have a bank account (World Bank, 2015). In terms of mobile money accounts.

<sup>4</sup> According to UNICEF, 10% of the children living in East Asia and Pacific are involved in child labour; no statistics are available for the South Asian region, but the figure for India is 12%.

school enrolment and grade attainment. For instance, in the context of Tanzania, between 1991 and 2009, the government enacted a few regulations that aimed at prohibiting child labour and promoting school enrolment. Some of the regulations include the Convention on the Rights of the Child in 1991; the African Charter on the Rights and Welfare of the Child in 2003; and the Law of the Child Act, 2009 (ILO, 2016; United Republic of United Republic of Tanzania, 2015).

Despite these efforts put forward by the government and other agencies, evidence shows that child labour and low school enrolment are widespread (ILO, 2017b). For instance, in 2016, out of the 152 million in child labour, Africa ranks highest both in the percentage of children in child labour – one-fifth – and the absolute number of children in child labour – 72 million (ILO, 2017b). These dynamics are likely to be driven by poverty, imperfect credit and insurance markets, which are prevalent in developing countries (Bandara et al., 2015; Beegle et al., 2006; Skoufias, Rabassa, & Olivieri, 2011).

This paper contributes to a growing literature on mobile money adoption and households' outcomes in developing countries (Mbiti & Weil, 2013; Kikulwe, Fischer, & Qaim, 2014; Munyegera & Matsumoto, 2016; Jack & Suri, 2014; Jack & Suri, 2016; Ky, Rugemintwari, & Sauviat, 2018; Rotondi & Billari, 2021; Abiona & Koppensteiner, 2022). While these existing studies focus on the effects of mobile money adoption on household's welfare, risk-sharing against negative income shocks, and saving behaviour, this study, however, contributes to the existing literature by exploring not only the impacts of mobile money adoption on child labour and schooling in Tanzania, but also the various pathways or mechanisms through which using mobile money service affects child labour and educational outcomes. Specifically, while this paper speaks to the findings by Rotondi and Billari (2022), and Abiona & Koppensteiner (2022), it, however, differs in the following respects. First, Rotondi & Billari (2021) focuses on the association between mobile money usage and school participation in four countries, namely, Kenya, Nigeria, Tanzania, and Uganda, our paper is mainly concerned with establishing a causal relationship between mobile money adoption and child schooling and labour market outcomes in Tanzania. In addition, the central focus of Abiona & Koppensteiner (2022) is to investigate the mitigating role of mobile money on child schooling and labour outcomes for households exposed to rainfall shocks, this paper, however, focuses largely on the direct effect of mobile money adoption on child labour and schooling. In addition, while Abiona & Koppensteiner (2022) uses a short panel – 2010 and 2012 waves of the TNPS, this paper uses an extended panel for DID by considering data for 2008, 2010 2012, and 2014 waves of the TNPS. Moreover, similarly, our paper relates to studies such as Alcaraz et al. (2012), Bargain and Boutin (2015), and Cuadros-Menaca and Gaduh (2020), which investigate the nexus between remittances and child schooling and labour market outcomes. Our paper lends credence to these studies by identifying remittances as a potential channel through which mobile money adoption affect child labour and educational outcomes.

## 2. Relevant literature

From a theoretical standpoint, poverty is one plausible driver of child labour and low school enrolment in developing countries (Basu & Van, 1998). This is common among credit constrained households that are unable to borrow to smooth consumption or cope with covariate or idiosyncratic shocks. Hence, as a mitigation strategy, households could rely on child labour activities or withdrawing children from school. The introduction of mobile money could change households' behaviour, especially credit constrained households. Mobile money adoption is associated with benefits such as reduction of transaction costs, which could increase the size and frequency of remittances, increase saving and help households to better cope with negative shocks (Aron, 2017; De Weerd & Dercon, 2006; Suri and Jack, 2011; Suri and Jack, 2014). These outcomes could have implications on child labour and school enrolment in developing countries.

In the past few years, a large fraction of the population in many developing countries lacks access to basic financial services. However, the recent introduction of mobile money has helped to circumvent the financial service access gap of the unbanked poor in those countries (Jack and Suri 2014, 2016; Munyegera & Matsumoto, 2016). Mobile money allows individuals to use their mobile phones to deposit and transfer funds as well as make payments for goods and services (Munyegera and Matsumoto 2018). An emerging body of literature shows that financial inclusion in the form of mobile money adoption or usage plays a significant role in reducing poverty by facilitating saving and borrowing, empowering the poor to smooth consumption and insuring households against negative income shocks through the remittances receipt (Demirguc-Kunt & Klapper, 2012; Dupas & Robinson, 2013; Jack & Suri, 2014; Munyegera & Matsumoto, 2016; Riley, 2018).<sup>5</sup>

This paper contributes to two main strands of literature. First, this paper contributes to the literature on the adoption or usage of mobile money services and its insurance role against shocks in developing countries. This strand of literature evaluates the effect of mobile money on households' outcomes and its insurance role in risk-sharing and smoothing of consumption. Some of the mechanisms through which mobile money services allow for risk-sharing are savings and receipt of remittances. Yang and Choi (2007) provide evidence for remittances as an insurance against rainfall shocks for households in Philippines, and the study shows that the receipt of remittances compensates for a fall in income after rainfall shocks.

The receipt of remittance can be achieved much faster with the use mobile money technology since it involves the use of mobile phone with lower costs of financial transactions. This allows users access to wider risk-sharing networks and helps households in smoothing consumption (Jack & Suri, 2014; Munyegera & Matsumoto, 2016; Riley, 2018). Similarly, Jack and Suri (2014) investigate how mobile money facilitates consumption smoothing for households that are exposed to negative idiosyncratic shocks in Kenya. They find that the consumption of households that are non-users of mobile money falls by 7%–10% after a shock, and there is no

<sup>5</sup> Financial inclusion refers to a situation where an individual has access to the services of a formal financial institution like a commercial bank, micro-finance institutions and insurance companies.

corresponding fall for consumption for users of mobile money services.

Second, this paper contributes to the literature on potential determinants of child labour. This literature focuses on the existing studies that identify some underlying factors or determinants that contribute to the incidence or perpetuation of child labour and low school enrolment in developing countries. The major arguments for the incidence of child labour stems from poverty, credit market imperfections, imperfect land and labour markets and household characteristics (Alvi & Dendir, 2011; Baland & Robinson, 2000; Basu & Van, 1998; Beegle et al., 2006; Cain, 1982; Dehejia & Gatti, 2002; Dumas, 2013; Rajan, 2001; Zeldes, 1989). In a seminar paper, Basu and Van's (1998) reveal that poverty is the main driver of child labour. Households send their children to work only if the adult wage falls below a certain threshold where the household subsistence requirements cannot be met without an alternative source of income. Child labour provides that source (the so-called Luxury Axiom). On the other hand, child labour is considered a substitute for adult labour (the Substitution Axiom). Although household survival is the main underlying reason for child labour in this model, it also relates to the permanent income hypothesis and consumption smoothing.

Overall, this paper contributes to the existing literature by empirically investigate the impact of using mobile money on child labour and school enrolment. Additionally, the study contributes to the literature by identifying potential channels through which the use of mobile money affects child labour and school enrolment.

### 3. Data source

#### 3.1. Data source: Tanzanian National Panel Survey (NPS)

The four waves of data used in the analysis of this paper are drawn from the Tanzania National Panel Surveys (TNPS), which are: the 2008/09, 2010/11, 2012/13 and 2014/15. The TNPS is a national representative survey conducted by the National Bureau of Statistics of Tanzania in collaboration with the World Bank Living Standards Measurement Study-Integrated Surveys on Agriculture (LMSA-ISA). The survey collects detailed information on individual, household, and community-level characteristics. The panel nature of the TNPS allows for the same households to be interviewed over time.

The TNPS tracks 3265 baseline households from the 2008/2009 waves and all the split-offs of these households over time. Specifically, the second wave of the NPS tracked 97 percent of the original households, the third wave tracked 96 percent of second wave, and this generated an attrition rate of about 3.9 percent. In the second wave of data collection, the number of panel households increases to 3924; and in the third wave, it increases to 5010 households. In the analysis of this paper, we use a sample of children from four waves of the TNPS, which are 2008/09, 2010/11, 2012/13, and 2014/15. The full sample comprises children between the age of 5–17, and the number of children across the four waves are as follows: 5866 for wave 1; 6,985 for wave 2, 8250 for wave 3, and 5531 for wave 4. See Table 1 for the summary statistics of the variables used in the analysis of this paper.

##### 3.1.1. Child labour and educational outcomes data

Following Bandara et al. (2015), Frempong and Stadelmann (2019), and Cuadros-Menaca and Gaduh (2020), the dependent variables of interests include both binary and continuous variables for school enrolment, child labour, farm work in the last 7 days as well as domestic or home chores in the previous day. In addition, we use as outcomes measures that capture hours worked in the last 7 days prior to the survey for wages, household-owned businesses, and household-run farming and hours per week spent on the household tasks of collecting firewood or fuels and water. The National Panel Survey of Tanzania contains detailed data on education and time-use of each household member of age 5 and above. However, we restrict our analysis to children between the age of 5 to 17-year-old. Following the ILO definition of child labour, the study focuses on children aged 5–17.<sup>6</sup>

#### 3.2. Summary statistics

Table 1 presents the summary statistics for child as well as household's characteristics for four waves (2008/09, 2010/11, 2012/13, and 2014/15) of the data used in the analysis.

Over the four periods, considering descriptive statistics for the outcome variables, on average, 68.8% reported school enrolment or attendance. On average, 9% reported work for pay, profit, barter, or home use during the last 7 days. Further, 21% reported engaged in farm work. For hours spent on household farm, on average, about 4 h were spent on household farm as reported. Moreover, about 10% of the children reported being engaged in fetching water and collecting firewood the previous day before the surveys. Figs. 1 and 2 shows mobile money adoption and child labour and school enrolment over time. See Table A1 in the appendix for definition of the variables used in the analysis of this paper.

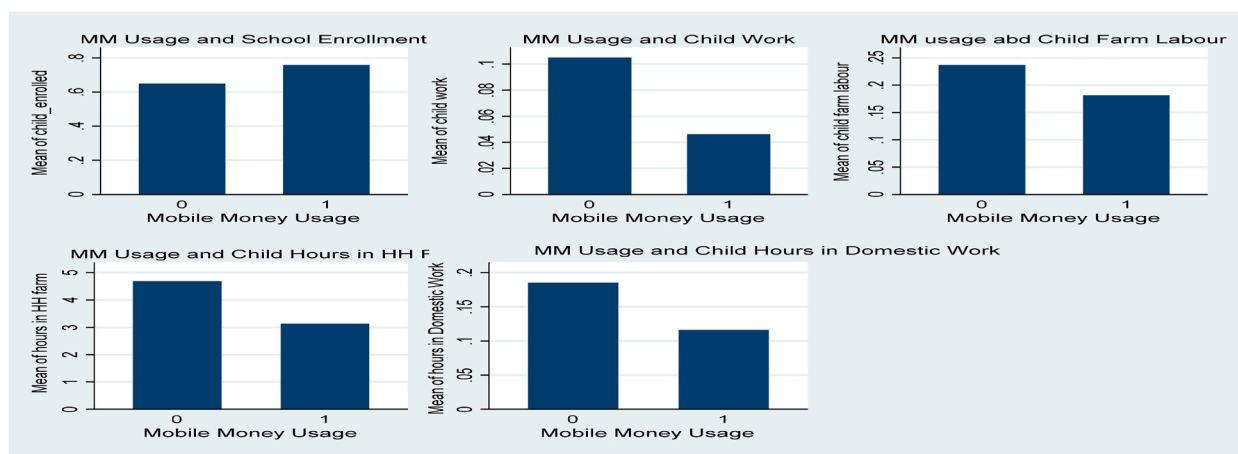
Table 2 presents descriptive statistics of test of mean difference by mobile money adoption for child labour and school enrolment. The results reveal that mobile money users, on average, reported 76% child school enrolment, while non-mobile money users, 67% of children are enrolled in school. About 5% of children are engaged in child work in households that uses mobile money, while 11% of child work are reported for households that are non-mobile money users. In addition, mobile money users reported an average of 3 h spent on household farm, while non-users of mobile money reported about 4 h. The descriptives are similar for domestic work and hours spent on domestic work, respectively.

<sup>6</sup> Child Labour: Global estimates 2020, trends and the road forward - UNICEF DATA.

**Table 1**  
Summary statistics of variables.

Outcomes variables	Mean	Standard deviation
School attendance (=1)	68.8%	0.463
Work (=1)	9.0%	0.286
Work (farm) labour (=1)	21.0%	0.407
Hours spent on household farm	4.007	10.765
Domestic work (=1)	9.8%	0.297
Hours spent on domestic work	0.225	2.635
<i>Control variables</i>		
Child age	10.722	3.735
Male-child	49.7%	0.500
Household size	7.552	3.889
Age of household head	47.946	13.225
Male household head	77.2%	0.419
Household head married	79.2%	0.405
Household head completed primary education	41.7%	0.493
Mobile money	31.2%	0.463
Total education expenditure	65090.87	2210
Remittance receipt	15.4%	0.361
Observations	26,632	

**Source:** Authors' computation using the TNPS for 2008/2009, 2010/11, 2012/13, and 2014/15.



**Fig. 1.** Bar graph of mobile money adoption and child labour and school enrolment.

#### 4. Research methodology

The use of platform such as mobile money services can improve children's outcomes through the facilitation of savings and borrowings, empowering the poor to smooth consumption and insuring households against negative income shocks (Munyegera & Matsumoto, 2016; Riley, 2018). This paper uses a difference-in-differences approach, and instrumental variables approach to investigate the nexus between mobile money adoption and child labour and school enrolment in Tanzania. In light of this, in this section, this study considers the empirical analysis under the following subheadings.

##### 4.1. Difference-in-differences approach

Firstly, we examine the effect of mobile money adoption on child labour and school enrolment using a difference-in-differences (DiD) approach. The DiD approach exploits variation in the adoption of mobile money over time to estimate the relationship between households' mobile money adoption and child labour and schooling. The use of DiD captures the significant differences in child labour and school enrolment across the treatment (mobile money users) and control groups (non-users of mobile money), which occur between pre-treatment and post-treatment periods. Specifically, from the datasets used in this analysis, in the first period (2008/2009), there is



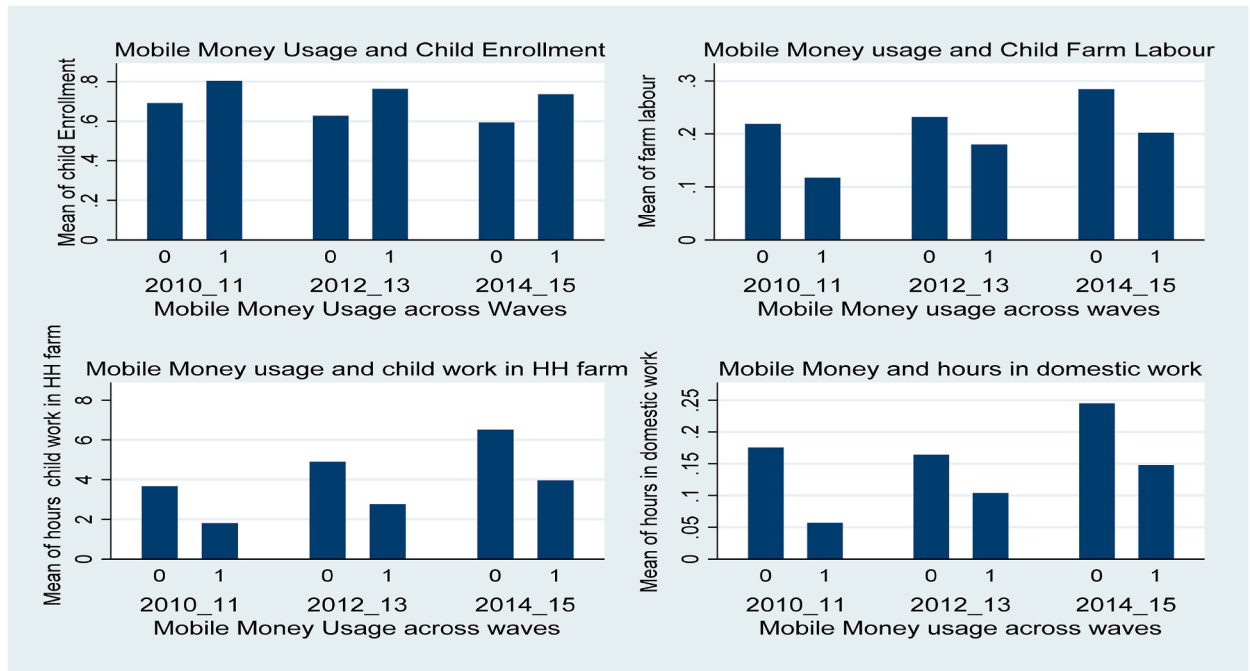


Fig. 2. Bar graph of mobile money adoption and child labour and school enrolment over time.

Table 2

Test of Mean Difference for outcome variables.

Variable	No Mobile Money ( $M_0$ )	Mobile Money Use ( $M_1$ )	Difference ( $M_0 - M_1$ )
School enrolment	0.665 (0.003)	0.757 (0.005)	-0.091*** (0.006)
Child Work	0.105 (0.002)	0.046 (0.002)	0.058*** (0.004)
Hours spent on household farm	4.291 (0.078)	3.125 (0.115)	1.166*** (0.153)
Domestic work (=1)	0.109 (0.002)	0.066 (0.003)	0.043*** (0.004)
Hours spent on domestic work	0.261 (0.021)	0.115 (0.006)	0.145*** (0.037)

Note: \*, \*\*, and \*\*\* indicate significance at 10%, 5%, and 1%, respectively. Standard errors in parenthesis.

Source: Authors' computation.

no adoption or usage of mobile money, but in the second period to fourth period, some households used mobile money, while other house did not use mobile money. The use of DiD is based on the identification assumption that the group-specific trends in child labour and school enrolment would be identical in the absence of the introduction of mobile money (treatment).

Using data before and after the introduction of money, this study estimates the equation below<sup>7</sup>

$$Y_{iht} = \alpha_i + \sigma MM_{ht} + \mu MM_{ht} \times Post_t + \phi X_{iht} + \omega Z_{ht} + \tau_t + \varepsilon_{iht} \quad (1)$$

where  $Y_{iht}$  is child labour (school enrolment) for child  $i$  in household  $h$  at time  $t$  (we consider outcomes such as child enrolment in school, child work, engaged in household farm activities, and engaged in domestic chores or work) for child  $i$  in household  $h$  at period  $t$ .<sup>8</sup> Moreover,  $\alpha_i$  is district fixed effect,  $\mu MM_{ht} \times Post_t$  is a binary indicator of mobile money adoption for the period after 2008, and it represents the parameter of interest (mobile money usage impact on child labour and school enrolment). Based on prior expectations, the effect of mobile money adoption should have a negative sign on child labour, but a positive sign on school enrolment from the regressions.  $X_{iht}$  represents the characteristics of child  $i$  in household  $h$  at time  $t$  and  $Z_{ht}$  captures household-level controls at time  $t$ .  $\tau_t$  and  $\varepsilon_{iht}$  denote year fixed effect and error term, respectively. The standard errors are clustered at the enumeration area (primary sampling unit).

<sup>7</sup> The model specification in the choice of explanatory variables include the use of child's and household's characteristics in the regressions. This follows such as Alcaraz et al. (2012); Alam (2015); Bandara et al. (2015); Bargain and Boutin (2015); Ajefu and Moodley (2020); Cuadros-Menaca and Gaduh (2020).

<sup>8</sup> The choice of the dependent variables in this study follows Ajefu (2018), and Kafle, Jolliffe, and Winter-Nelson (2018); Cuadros-Menaca and Gaduh (2020); Ajefu and Moodley (2020).

#### 4.2. Instrumental variables analysis

Following the estimations based on equation (1), we assumed that the use of mobile money by household is conditionally mean-independent, given the other control variables included in the regressions. In other words, the estimated coefficients are only valid if mobile money adoption is not correlated with the error term conditional on the other covariates in the regression. However, the decision to use mobile money services may be correlated with time variant unobservable factors that also affect child labour and school enrolment.<sup>9</sup> Therefore, mobile money adoption may be endogenous, which could have biased the estimates of the results obtained based on the regression results from equation (1).

As a result of the potential endogeneity associated with the adoption of mobile money by households, we use the fourth wave (2014/15) of the TNPS to estimate an instrumental variables regression. Following Jack and Suri (2014; 2016), Munyegera and Matsumoto (2016), Riley (2018), Abiona & Koppensteiner, 2022, we used two instruments for the instrumental variable analysis, these include: (i) availability of mobile money agent in the village and, (ii) distance to the nearest mobile money agent as an instrument for mobile money adoption. These variables – presence of mobile agent in the village, and distance to the nearest mobile money agent are obtained from the TNPS. The theoretical justification for using expansion of mobile money network hinges on the assumption that the location of mobile money agent is not likely to be correlated with child labour and educational outcomes but there is the likelihood of a correlation between distance to the nearest mobile money agent (availability of mobile money point in the village) and mobile money adoption.

A potential source of bias may result from self-selection by mobile money agents into communities. For instance, if mobile money agents are in villages or communities with a greater proportion of wealthier residents, such characteristic may be correlated with child labour and educational outcomes, and this could confound our results. However, evidence shows that most of the roll-out of mobile money agents during the early launch of mobile money services were existing sellers of airtime and sim cards. These microenterprises had links with mobile operators that spread across the country with high mobile phone ownership and cellular coverage (Shkaratan, 2012).

We used log of household's distance to the nearest mobile money agents and the availability of mobile money agent in the village as instruments for mobile money adoption. The basic assumption in the instrumental variable estimation is that the presence of mobile money agent in the village and distance to the nearest mobile money agent are not correlated with household and village characteristics that could affect child labour and education outcomes.

The first stage regression for the impact of mobile money on child labour and school enrolment is presented below as:

$$MM_h = \alpha_0 + \alpha_1 \log \text{distMM Agent}_h + \alpha_2 \text{presence of MM}_h + X_h + v_h \quad (2)$$

where  $MM_{ht}$  is adoption of mobile money by household  $h$  at time  $t$ ,  $\log \text{MM Agent}_{ht}$  log. of distant to nearest mobile money agent<sup>10</sup> (and availability of mobility of mobile money point in the village) by household  $h$  at time  $t$ , and  $X_{ht}$  is household and community covariates. Using the IV approach,  $\mu$  from equation (1) is the parameter of interest that captures the impact of mobile money on child labour and schooling. The first stage regressions as well as weak instrument statistics, and overidentification test of all instruments are presented in Table A2 in the appendix. The second-stage regression is presented below:

$$Y_{ih} = \sigma MM_h + \phi X_{ih} + \omega Z_h + \varepsilon_{ih} \quad (3)$$

where  $Y_{iht}$  is child labour and school enrolment for child  $i$  in household  $h$ ,  $MM$  is binary variable for mobile money adoption and it is equals to one if households use mobile money and zero if otherwise.  $X_{ih}$  represents the characteristics of child  $i$  in household  $h$ , and  $Z_h$  captures household-level control variables. We estimate separate regressions for the outcome variables using the two-stage least squares regression.

#### 5. Results and discussions

Table 3 presents the results of a difference-in-differences regressions of the effect of mobile money adoption on child labour and school enrolment. Results from Column (1) reveal that households with mobile money adopters are 15 percentage points more likely to have their children enrolled in school compared to households that are non-adopters of mobile money. Column (2) shows that households using mobile money services are 9 percentage points less likely to have their children engaged in child labour compared to non-users of mobile money.

In Column (3) of Table 3, the results show that households using mobile money services are 10 percentage points less likely to have children engaged in farm labour activities. We find consistent results for Column 4 to 6, which captures hours spent on household farm, domestic work, and hours spent in domestic work. These findings are related to evidence obtained by Rotondi and Billari (2022), which

<sup>9</sup> For instance, using remittance as an outcome variable in the econometrics specification from equation (1) above could lead to biased results. Mobile money adoption may be determined by the likelihood of remittance received by the households, leading to a simultaneous bias in coefficient estimates.

<sup>10</sup> The information on distance to the nearest mobile money agent is not self-reported, rather it is provided by the survey using the household's coordinates. The absence of self-reported information on the instrument allays the concern of measurement errors associated with self-reported information.

**Table 3**  
Mobile Money Adoption, Child Labour and Schooling using DID approach.

Variable	Schooling (1)	Work (2)	Farm labour (3)	Hrs HH farm (4)	Domestic work (5)	Hrs. dom. work (6)
Mobile Money $\times$ Post	0.149*** (0.100)	−0.088*** (0.005)	−0.101*** (0.007)	−0.315*** (0.022)	−0.052*** (0.006)	−0.060*** (0.006)
Child Age	0.003*** (0.001)	0.015*** (0.000)	0.029*** (0.001)	0.084*** (0.001)	0.012*** (0.001)	0.012*** (0.001)
Male-Child	−0.024*** (0.006)	0.006* (0.003)	0.054*** (0.005)	0.180*** (0.013)	−0.060*** (0.003)	−0.057*** (0.004)
Household size	−0.008*** (0.001)	0.002*** (0.007)	0.007*** (0.001)	0.025*** (0.002)	0.001 (0.001)	0.001 (0.001)
HH Age	0.001*** (0.000)	0.000 (0.000)	0.002*** (0.000)	0.004*** (0.001)	0.001*** (0.000)	0.001 (0.000)
HH Male	−0.004 (0.014)	0.000 (0.008)	−0.050 (0.011)	−0.133*** (0.032)	0.007* (0.008)	0.017* (0.009)
HH Married	0.005 (0.014)	−0.021** (0.008)	0.060*** (0.011)	0.169*** (0.033)	0.016* (0.009)	0.027*** (0.009)
HH completed pry education	−0.024*** (0.008)	−0.009** (0.005)	−0.052*** (0.006)	−0.143*** (0.018)	−0.022*** (0.005)	−0.024*** (0.005)
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.211	0.323	0.386	0.382	0.284	0.285
Observations	26,632	26,632	26,632	26,632	26,632	26,632

**Notes:** Robust standard errors are clustered at the enumeration area level are reported in parentheses. \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively.

focuses on the association between mobile money usage and school participation in four countries, namely, Kenya, Nigeria, Tanzania, and Uganda.

Table 4 presents the two-stage least squares (2SLS-IV) estimates of the effects of mobile money adoption on child labour and schooling using household's distance to the nearest mobile money agent, and presence of mobile money agent in the village, as an instrument for mobile money adoption. In Column (1), the result reveals that households with mobile money are 86 percentage points more likely to have their children enrolled in school compared to non-users of mobile money.

From Column (2), the result reveals that households with mobile money are 0.7 percentage points less likely to have their children in child labour activities compared to non-users of mobile money services (though not statistically significant). However, the result is not statistically significant. In Column (3), the result shows that households using mobile money services are 83 percentage point less likely to have their children engaged in household farm labour activities compared to non-users of mobile money services. From Column 4 to 6, we find that households that adopted mobile money have children that spent fewer hours on household farms and domestic works, and less likely to be engaged in domestic work (fetching water and collecting firewoods). The magnitude of co-efficients of the 2SLS-IV of the outcome variables in Column 1, 2, 3, 4, 5 and 6, are larger than the coefficients of the DiD regressions reported in Table 3. This may be largely due to reasons related DiD regressions underestimating the effects of mobile money adoption on child labour and school enrolment. These findings contribute to existing studies such as [Filmer and Schady \(2011\)](#), [Del Carpio, Loayza, and Wada \(2016\)](#), [Cuadros-Menaca and Gaduh \(2020\)](#), and [Kandulu, Wheeler, Zuo, and Sim \(2020\)](#). These studies investigate the relationship between remittances, conditional cash transfer programmes, and microcredit on child labour and school enrolment in developing countries context.

### 5.1. Heterogeneous effects

To estimate the heterogeneous effect of mobile money adoption on child labour and schooling by gender and age, we use split sample in a difference-in-differences regressions similar to [Del Carpio et al. \(2016\)](#), [Cuadros-Menaca and Gaduh \(2020\)](#), and [Dumas](#)

**Table 4**  
Mobile money adoption, child labour and schooling (instrumental variables approach).

Variable	Schooling (1)	Work (2)	Farm labour (3)	Hrs HH farm (4)	Domestic work (5)	Hrs. dom. work (6)
Mobile Money	0.856*** (0.207)	−0.007 (0.024)	−0.832*** (0.144)	−2.682*** (0.433)	−0.200*** (0.068)	−0.173** (0.068)
Child age	0.008* (0.004)	0.008*** (0.001)	0.035*** (0.002)	0.103*** (0.008)	0.013*** (0.001)	0.012 (0.001)
Child-Male	0.036** (0.017)	0.002 (0.005)	0.073*** (0.014)	0.277*** (0.047)	−0.073*** (0.007)	−0.072*** (0.006)
Household size	−0.012** (0.005)	−0.002*** (0.001)	0.017*** (0.005)	0.051 (0.016)	0.003 (0.002)	0.003 (0.002)
HH Male	−0.08* (0.040)	0.007 (0.009)	−0.013 (0.047)	−0.003 (0.138)	0.001 (0.026)	−0.000 (0.027)
HH Married	0.124*** (0.045)	−0.014 (0.008)	−0.012 (0.042)	−0.057 (0.135)	0.012 (0.021)	0.017 (0.018)
HH Age	0.003* (0.001)	−0.000** (0.000)	0.001 (0.001)	0.003 (0.004)	−0.000 (0.001)	0.000 (0.001)
HH Primary school	0.027 (0.039)	0.010* (0.005)	−0.143*** (0.031)	−0.402*** (0.090)	−0.044*** (0.01)	−0.042 (0.012)
Observations	5179	5179	5179	5179	5179	5179

**Notes:** Robust standard errors are clustered at the enumeration area level are reported in parentheses. \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively.



(2020). Table 5 reports heterogeneous effect by gender in the nexus between mobile money adoption and child labour and school enrolment. The results of the analysis of the boys' sample are presented on Panel A of Table 5, while the girls' sample are in Panel B. The results from Column (1) shows that households using mobile money services are 18 percentage points more likely to have boys enrolled in school compared to non-users of mobile money services. In Column (2) of Table 4, the result shows that mobile money adopters are 0.2 percentage points less likely to have boys engaged in child labour compared to non-users of mobile money services. Column (3) reveals mobile money adopters are 11 percentage points less likely to have boys engaged in a household's farm labour activities compared to non-users of mobile money services. The study found consistent with our hypothesis for Column 4, 5, and 6.

The results from Panel B of Table 5 presents results for girls' sample of the effect of mobile money on child labour and school enrolment. In Column 1 shows that mobile money adopters are about 13 percentage points more likely to have girls enrolled in school compared to non-adopters of mobile money services. Column 3 shows that households with mobile money are 10 percentage points less likely to have girls engaged in a household's farm labour compared to non-users of mobile money services. In terms of hours of work in household farm for girls, in Column 4, we find that mobile money adoption leads to decline in hours of work for girls. Column 5 and 6 present results of domestic activities, and the results show that, compared to non-users of mobile money, mobile money adoption by households are associated with a decline in having girls in domestic activities (such as fetching water and collecting firewood) as well as hours spent on those domestic activities.

Table 6 presents heterogeneous effects of mobile money on child labour and school enrolment by ages of children. The results are for split samples of ages of children between 5 and 11 years (results shown in Panel A of Table 5) and 12–17 years (results shown in Panel B of Table 6). From Column (1) of Table 6 and Panel A, the study finds positive effect of mobile money adoption on the likelihood of being enrolled in school for children between the age range of 5–11 years. Specifically, households that use of mobile money 18 percentage points more likely to their children enrolled in school compared to households without mobile money. In Column (2) shows negative effect of mobile money on child labour (work) by 1.2 percentage points, while Column (3) shows that mobile money adopters are 6 percentage points less likely to have children aged 5–11 engaged in farm labour. Further, in Column (4), the study finds that households using mobile money (relative to non-users of mobile money) is negatively associated with a decline in hours of domestic work for children within the age bracket of 5–11. From Column (5) and (6) reveal similar patterns, particularly for domestic work and hours spent in domestic work, respectively.

From Table 6 and Panel B, the results show the effect of mobile money on child labour and school enrolment for children for the age bracket of 12–17 years. The result in Column (1) shows that households with mobile money are 12 percentage points more likely to have children in age category 12–17 enrolled in school. We find no statistically significant effect of mobile money on child labour as reported in Column 2. From Column 3, households using mobile money are 15 percentage points less likely to have children in the age bracket of 12–17 engage in farm labour activities. Column 5 and 6 presents the results of the effects of mobile money on domestic work and hours spent on domestic activities in the previous day before the survey.

In Table 7, the analysis uses a system of linear equations based on the assumption that errors are correlated across equations for a given individual but are uncorrelated across individuals. The multivariate linear regression model used in this paper is referred to as a seemingly unrelated regression (SUR) system. The study uses six equations based on the child labour and schooling outcomes obtained for this analysis. The results from the SUR system are presented in Table 7. The findings are consistent with those obtained using a DID approach and 2SLS-IV estimations.

## 5.2. Potential pathways or channels analysis

This study identifies remittance receipts and education expenditure as potential channels through which mobile money adoption affects child labour and schooling.

**Table 5**  
Mobile Money Adoption, Child Labour and Schooling (Disaggregated analysis by gender) using DiD.

Variable	Schooling (1)	Work (2)	farm labour (3)	Hrs HH farm (4)	Domestic work (5)	Hrs. dom. work (6)
<b>PANEL A: Boys</b>						
Mobile Money × Post	0.180*** (0.015)	−0.002 (0.012)	−0.107*** (0.012)	−0.372*** (0.036)	−0.040*** (0.008)	−0.047*** (0.009)
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.335	0.468	0.480	0.477	0.374	0.402
Observations	13,253	13,253	13,253	13,253	13,253	13,253
<b>PANEL B: Girls</b>						
Mobile Money × Post	0.134*** (0.015)	−0.001 (0.008)	−0.103*** (0.011)	−0.287*** (0.032)	−0.066*** (0.010)	−0.075*** (0.011)
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.310	0.438	0.448	0.438	0.397	0.388
Observations	13,379	13,379	13,379	13,379	13,379	13,379

**Notes:** Robust standard errors are clustered at the enumeration area level are reported in parentheses. \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively. The control variables used include child age, household size, dummy for male headed household, dummy for married household head, age of household head, and head of household completed at least primary education.

**Table 6**

Mobile Money Adoption, Child Labour, and Schooling (Disaggregated analysis by age) using DID.

Variable	Schooling (1)	Work (2)	farm labour (3)	Hrs HH farm (4)	Domestic work (5)	Hrs. dom. work (6)
<b>PANEL A: 5–11 years</b>						
Mobile Money × Post	0.175*** (0.013)	−0.012* (0.006)	−0.057*** (0.009)	−0.188*** (0.026)	−0.034*** (0.007)	−0.037*** (0.007)
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.313	0.436	0.407	0.408	0.356	0.360
Observations	15,187	15,187	15,187	15,187	15,187	15,187
<b>PANEL B: 12–17 years</b>						
Mobile Money × Post	0.123*** (0.017)	0.015 (0.016)	−0.152*** (0.015)	−0.467*** (0.045)	−0.064*** (0.012)	−0.080*** (0.013)
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
District fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
R-Squared	0.354	0.458	0.477	0.473	0.385	0.396
Observations	11,445	11,445	11,445	11,445	11,445	11,445

**Notes:** Robust standard errors are clustered at the enumeration area level are reported in parentheses. \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively. The control variables used include dummy for male child (=1), household size, dummy for male headed household, dummy for married household head, age of household head, head of household completed at least primary education.

**Table 7**

Mobile Money Adoption, Child Labour and Schooling using system of equations.

Variable	Schooling (1)	Work (2)	farm labour (3)	Hrs HH farm (4)	Domestic work (5)	Hrs. dom. work (6)
Mobile Money × Post	0.113*** (0.007)	−0.006 (0.004)	−0.077*** (0.006)	−0.258*** (0.017)	−0.045*** (0.004)	−0.046*** (0.005)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.021	0.111	0.093	0.101	0.039	0.034
Observations	26,624	26,624	26,624	26,624	26,624	26,624

**Notes:** Robust standard errors are reported in parentheses. \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively. The control variables used include child age, household size, dummy for male headed household, dummy for married household head, age of household head, and head of household completed at least primary education.

See Fig. 3 for a diagram of the potential pathways through which mobile money adoption could affect child labour and school enrolment. A few evidence reveals that remittances and education expenditure are positively with child labour and schooling (Alcaraz et al., 2012; Bargain & Boutin, 2015; Cuadros-Menaca & Gaduh, 2020; Rotondi & Billari, 2022; Abiona & Koppenssteiner., 2022). Therefore, this paper identifies some potential channels through mobile money adoption affects child labour and school enrolment. Table 8 shows positive association between mobile money adoption and remittance receipt and education expenditure.

### 5.3. Mediation analysis

One objective of this paper is to identify the channels through which mobile money adoption are associated with child labour and schooling enrolment. In other words, the study aims to investigate the mechanisms by which treatment T (mobile money) relates to outcomes Y (child labour and schooling enrolment) through mediator (s) M. In this paper, we consider three mediator variables which are remittance receipt and educational expenditure. The goal of this section is thus to decompose the association between mobile money and child labour and schooling enrolment into an indirect effect (representing a given mechanism) and a direct effect (representing all other channels), and this study adopts the mediation analysis proposed by Imai, Keele, Tingley, and Yamamoto (2011) and Imai, Keele, and Tingley (2010).

Table 9 reveals the results of the mediation analysis using remittances receipt and education expenditure as the mediators. From Panel A of Table 9, this paper explores remittances receipt as a pathway through which mobile money affect child labour and schooling enrolment, and the findings reveals a positive association between remittances receipt and school enrolment but shows a negative association between remittances receipt and child labour outcomes. These results are consistent with existing studies that established a nexus between remittances and child labour and schooling enrolment (Alcaraz and Salcedo, 2012; Cuadros-Menaca & Gaduh, 2020). The positive (negative) association between mobile money and child schooling enrolment (child labour) could result from the risk-sharing and insurance roles of mobile money for households, especially, in many developing countries (Maccini & Yang, 2009; Munyegera & Matsumoto, 2016). In Panel B of Table 9, this paper explores education expenditure as a pathway or mediator through which mobile money affect child labour and school enrolment, and we find a positive (negative) association between mobile money and school enrolment (child labour outcomes). The findings are consistent with evidence by Tabetando and Matsumoto (2020).

## 6. Conclusion

There has been a boost to the financial inclusion status of households in Tanzania since the introduction of mobile money. The

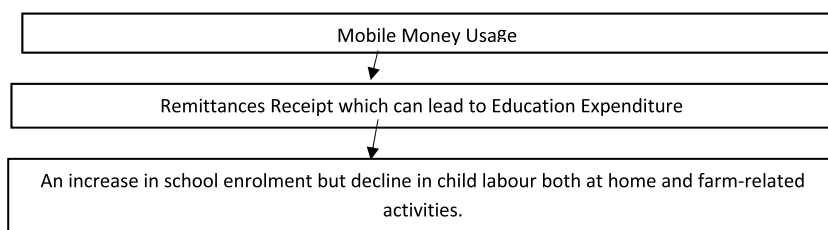


Fig. 3. Channels of analysis between mobile money and child labour and school enrolment.

Table 8

Mobile money, remittances and education expenditure.

Variable	Remittance receipt	Education expenditure
Mobile money	0.126*** (0.005)	2.330*** (0.099)
Control variables	Yes	Yes
Household fixed effects	Yes	Yes
District fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
R-squared	0.660	0.293
Observations	20,761	26,632

**Notes:** Robust standard errors are reported in parentheses. \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively. The control variables used include child age, household size, dummy for male headed household, dummy for married household head, age of household head, and head of household completed at least primary education.

Table 9

Mechanisms of the relationship between mobile money adoption and child labour and schooling using mediation analysis.

	Attend School (1)	Work (2)	Farm labour (3)	Log. Hrs HH farm (4)	Domestic work (5)	Log. Hrs domestic work (6)
<b>PANEL A: Effect of mobile money on mediation (remittances)</b>						
Mobile money	0.145*** (0.005)	0.145*** (0.005)	0.145*** (0.005)	0.145*** (0.005)	0.145*** (0.005)	0.145*** (0.005)
Effect of mobile money and mediator on outcome						
Mobile money	0.129*** (0.007)	−0.014*** (0.004)	−0.084*** (0.006)	−0.267*** (0.017)	−0.050*** (0.004)	−0.052*** (0.004)
Remittances	0.021** (0.009)	−0.005 (0.005)	−0.038*** (0.008)	−0.044** (0.023)	−0.027*** (0.005)	−0.031 (0.006)
Direct effect	0.129	−0.015	−0.085	−0.269	−0.051	−0.052
Indirect effect	0.003	−0.001	0.006	−0.007	−0.004	0.004
Total effect	0.132	−0.015	−0.079	−0.262	−0.046	−0.048
% of total effect mediated	0.024	−0.042	−0.070	−0.025	−0.086	−0.094
<b>PANEL B: Effect of mobile money on mediation (ln edu. expend.)</b>						
Mobile money	2.067*** (0.073)	2.067*** (0.073)	2.067*** (0.073)	2.067*** (0.073)	2.067*** (0.073)	2.067*** (0.073)
Effect of mobile money and mediator on outcome						
Mobile money	0.046** (0.003)	−0.003 (0.004)	−0.058*** (0.006)	−0.179*** (0.017)	−0.043*** (0.004)	−0.044*** (0.005)
Log. education expenditure	0.085*** (0.000)	−0.007*** (0.000)	−0.010*** (0.001)	−0.039*** (0.001)	−0.001*** (0.000)	−0.001*** (0.000)
Direct effect	0.046	−0.003	−0.059	−0.180	−0.043	−0.044
Indirect effect	0.175	−0.015	−0.019	−0.081	−0.003	−0.003
Total effect	0.129	−0.019	−0.079	−0.260	−0.045	−0.047
% of total effect mediated	1.354	0.825	0.252	0.310	0.059	0.061

The Control variables used include child age dummy for male child (=1), household size, dummy for male headed household, dummy for married household head, age of household head, household head completed at least primary education and wave dummy. \*\*\*, \*\* and \* represent significance at 1, 5 and 10 percent, respectively.

adoption of mobile money has myriad benefits such as overcoming gaps in financial inclusion of the unbanked poor, facilitating saving, borrowing, empowering the poor to smooth consumption, and insuring of households against negative income shocks. These benefits are likely to be correlated with poverty reduction for the adopters of mobile money. In this paper, we explore the variation in the

adoption of mobile money across households over time to examine the causal impact of mobile money adoption on child labour and educational outcomes in Tanzania.

To establish a causal relationship between mobile money and child labour (school enrolment), we use instrumental variable estimation approach, in which household's distance to the nearest mobile money agent is used as instrument for mobile money adoption. The study identify remittances and education expenditure as the potential mechanisms or pathways through which mobile adoption affects child labour and school enrolment. In addition, the study identify heterogeneous effects by gender and ages of children as disaggregated analysis of how mobile money affects child labour and school enrolment in Tanzania.

Moreover, the results of the study provide evidence in support of negative (positive) relationship between mobile money adoption and child labour (school enrolment) in Tanzania. We also find heterogenous effects of mobile money on child labour (school enrolment) by child's age and gender, respectively. The study, therefore, find higher effects for boys than girls of money mobile adoption on school enrolment and labour market activities. Using mediation analysis, the relationship between mobile money adoption and child labour and school enrolment are identified through mechanisms or pathways such as remittances and education expenditure. The results reveal that the adoption of mobile money is positively related to the receipt of remittances and educational expenditures by households.

This paper contributes to the literature on child labour and educational outcomes by providing new evidence from the analysis of the relationship between mobile money and child labour (educational outcomes) in Tanzania using an instrumental variable estimation approach. The findings of this study suggest that, to curb child labour and improve educational outcomes in developing countries, policymakers should take into cognisance the financial inclusion of households such as the adoption of mobile money. Understanding of the channels through which mobile money usage are associated with child labour and school enrolment is critical to the issues of child labour and school enrolment in developing countries context. By unpacking the channels or mechanisms through which mobile money adoption are associated with child labour and school enrolment, as well as the heterogeneity in the relationship, this paper provides useful insights on policies that reduce child labour and boost school enrolment in developing countries. Further research is needed to investigate whether the extent or frequency of usage of mobile money matter on child labour and schooling outcomes. Do the results of the effects of mobile money adoption on child labour and schooling change with intensity or frequency of usage? This paper is unable to provide answers to this question from our analysis because of limited information on mobile money adoption provided by the Tanzanian National Panel Survey. However, empirical findings to this question will enhance the discussions of the implications of mobile money usage in developing countries.

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## Data availability

Data will be made available on request.

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## Appendix

**Table A1**  
Variable definitions

Variables	Definition of variables
School enrolment (=1)	Binary variable = 1 if a child currently attends school, = 0 if a child not enrolled in school.
Work (=1)	Binary variable = 1 if a child work for pay, profit, barter or home use during the last 7 days, = 0 if otherwise.
Work (farm) labour (=1)	Binary variable = 1 for participation in farm work in the last 7 day, = 0 if otherwise.
Hours spent on household farm	Continuous variable for hours spent on household farm in the last 7 days.
Domestic work (=1)	Binary variable = 1 if a child spent any time on household task, = 0 if otherwise.
Hours spent on domestic work	Continuous variable which captures hours per week spent on the household tasks of collecting firewood or fuels and water.
Child age	Categorical variable for child age which ranges between 5 and 17.

(continued on next page)

Table A1 (continued)

Variables	Definition of variables
Male-child	Binary variable for gender of the child = 1 if male, and 0 if female.
Household size	Continuous variable for number of individuals in the household
Age of household head	Categorical variable for age of head of the household
Male household head	Binary variable = 1 if head of household is male, = 0 if female
Household head married	Binary variable = 1 if head of household is married, = 0 if otherwise
Household head completed primary education	Binary variable = 1 if head of household completed at least primary education, = 0 if otherwise.
Mobile money	Binary variable = 1 if household uses mobile money, = 0 if otherwise
Total education expenditure	Continuous variable total expenditure on education
Remittance receipt	Binary variable = 1 if received remittance, = 0 if otherwise

Source: Authors' computation

Table A2

## First-Stage Regression

Variable	
Presence of mobile money agent(s) in the village	0.036 (0.060)
Log. distance to mobile money provider	−0.053** (0.021)
<i>Weak identification test:</i>	
Cragg-Donald Wald F statistic	62.366
Kleibergen-Paap rk Wald F statistic	32.902
<i>Overidentification test of all instruments:</i>	
Hansen J statistic:	0.394
Chi-sq(1) P-val	0.5304

**Notes:** Robust standard errors, clustered at the enumeration area level are reported in parentheses. \*\*\*, \*\* and \* represent significance at 1%, 5% and 10%, respectively. The Control variables used include child age dummy for male child (=1), household size, dummy for male headed household, dummy for married household head, age of household head, and household head completed at least primary education.

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