



**Stronger together? Shocks, educational investment, and self-help groups  
in Tanzania**

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# Stronger together? Shocks, educational investment, and self-help groups in Tanzania

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## Abstract

Do income shocks affect educational investment? Can self-help groups or Savings and Credit Cooperative Organizations (SACCOs) mitigate the impact of shocks on educational investment? Using nationally representative panel data from Tanzania, I find that educational investment suffers because of income shocks. On a whole, I find that income shock is negatively correlated with educational investment measured in per school-age child educational expenditure. However, I find no strong evidence to suggest that self-help groups and SACCOs buffer against income shocks. This suggests that locally available buffering mechanisms such as self-help groups and SACCOs do not necessarily help households to cushion against income shocks partly because many of the shocks affect most people in a given locality. Therefore, relying solely on the local mitigating mechanisms may not be a good option. This calls for a need to design policies that would enable households to insure themselves beyond their local insurance mechanisms. Public insurance and social safety nets programs may help households to overcome income shocks.

**Keywords** Shocks · Educational investment · Self-help groups · SACCOs · Tanzania

**JEL Classification** D1 · I25 · G20 · O1 · O16

## Introduction

Economists have long recognized that investment in children's education—human capital development—is an indispensable determinant of economic growth and development (Schultz 1961; Becker 1962; Lucas 1988; Mankiw et al. 1992; Jensen 2000). Investment in human capital also plays a pivotal role in enhancing human welfare by reducing poverty and its intergenerational transmission (Jensen 2000; Ferreira and Schady 2009). Moreover, evidence shows that private and social returns to education are not only large (Psacharopoulos 1981, 1994; Schultz 1993; Card 2001; Psacharopoulos and Patrinos 2018), but also are observed in both self- and wage-employment labour markets and for both men and

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women (Vijverberg 1993; Glick and Sahn 1997). Notwithstanding the numerous benefits attributed to educational investment, households in developing countries invest sub-optimally in schooling, even when the returns exceed the costs (Kazianga 2012). One of the reasons could be that households in developing countries are exposed to several shocks<sup>1</sup> (Hoddinott and Kinsey 2001; Dercon 2002, 2005; Kazianga and Udry 2006), which may disrupt their financial stability. Coupled with imperfection and incompleteness of financial and insurance markets, shocks may affect parents' abilities to invest optimally in their children's schooling.

In this paper, I examine the relationship between income shock and educational investment—an important parental input into the learning process. I also examine whether self-help groups or Savings and Credit Cooperative Organizations (SACCOs) help members to cushion against shocks. The paper contributes to two strands of literature. First, it complements the existing literature on shocks and child schooling in developing countries by examining the effect of income shock on both per school-age child educational expenditure and budget share of education. Its unique contribution is the use of 1-to 3-year-lagged income shocks (past income shocks) to examine how persistent the effects of shocks on educational investment are. To my knowledge, this has never been examined at least in the context of Tanzania. Second, the study contributes to the literature on household buffering mechanisms against shocks. This study is important, in particular, for a country like Tanzania where most households face risks of exposure to shocks and lack means to buffer against the shocks.

I use the nationally representative household panel data from Tanzania and exploits temporal variations in exposure to shocks. I also exploit the panel nature of the data and use household fixed effects model with region-specific time-fixed effects. The former helps to control unobserved household-specific time-invariant characteristics that would affect both shocks and educational investment. The latter eliminates aggregate region-year specific unobservable characteristics that would affect educational investment as well as shocks. I find that income shock is negatively and statistically correlated with per school-age child educational expenditure. Regarding the role of self-help groups and SACCOs in buffering against shocks, neither membership in self-help groups nor SACCOs is found to offset the effect of income shock on educational investment.

Like other investment ventures, educational investment demands financial resources. More importantly, because educational investment is not a one-time investment, parents must be financially stable to afford schooling costs throughout their children schooling cycle. Income shocks can disrupt parents' financial stability and ability to afford school expenses. Shocks—unexpected events within households and communities such as weather shocks, commodity price shocks, crop diseases, severe illness or death of a bread earner or other household members—can have deleterious and irreversible effects on children's schooling and development. For example, as a coping strategy to shocks, parents may withdraw their children from school to work in the household or elsewhere. Shocks can also affect or delay enrolment of prospective pupils if parents become unable to afford school expenses.

Studies have documented the harmful effects of shocks on various measures of schooling such as poor attendance of pupils (Jacoby and Skoufias 1997; Jensen 2000; Beegle et al. 2006; Bandara et al. 2015) and delayed enrolment (Jensen 2000; Gertler et al. 2004;

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<sup>1</sup> In this paper, shocks refers to negative shocks and income shock refers to fall in (loss of) income resulting from exposure to a negative shock.

Cogneau and Jedwab 2012; Björkman-nyqvist 2013; Shah and Steinberg 2017). Similarly, shocks such as severe illness, death or unemployment of a bread earner or household member have been associated with a high likelihood of school dropout (Duryea et al. 2007; Mottaleb et al. 2015; Glick et al. 2016) and poor performance in school (Duryea et al. 2007). Shocks have also been found to cause child labour (Jacoby and Skoufias 1997; Beegle et al. 2006; Duryea et al. 2007; Bandara et al. 2015). Elsewhere, droughts and commodity price shocks have been found to cause malnutrition, stunt and morbidity (Jensen 2000; Cogneau and Jedwab 2012). Most worryingly, these effects may have long-lasting negative implications.

While studies have examined the effects of shocks on various outcomes such as enrolment to school, child labour, school attendance and performance, little is known as to whether shocks affect parents' financial abilities and decisions to invest in education, particularly in Tanzanian context. Income shocks may reduce household's ability to afford school-related costs such as school fees, uniforms, books and other expenses which are important inputs in child schooling. This is a topic worthy of examination since investment in human capital development is widely recognised as one of the key drivers of economic growth and poverty reduction in developing countries.

Although income shocks can negatively affect parental investment in the education of their children, access to credits or insurance markets can mitigate the potential effect. Nevertheless, in Tanzania like in most developing countries, formal financial and insurance institutions are not readily available, particularly in rural areas. Moreover, even when they are available, most of the poor do not save in these institutions. In addition, the poor hardly borrow from these institutions because of stringent collateral requirements. If households cannot borrow or save, they must finance a given period's educational investment out of current-period's income. However, not all households can manage to make educational investment by relying on their current-period's income, more so, when they experience shocks.

Because of imperfection and incompleteness of financial markets, households normally use a number of strategies to cope with shocks. In Tanzanian, such coping mechanisms include self-help groups and SACCOs.<sup>2</sup> Both are increasingly gaining popularity especially among the poor.<sup>3</sup> While SACCOs are more formal than self-help groups, in most cases, both cover a small geographic area. A key feature shared by both arrangements is that loanable funds are mobilised by members through monthly contributions (savings). In addition, funds accumulate through interest on loans and fines for late payments or violations of other by-laws. Members can borrow money to meet their financial needs. For some self-help groups, members can also get financial support especially when they are in serious financial hardships resulting from unexpected negative events. Unlike formal financial or insurance markets, funds are more affordable and easily accessible (Abay et al. 2017); except for one's personal savings, no other collateral is required to get loans. The major goal of these associations is to improve the economic wellbeing of members. However, they can also play a crucial role in mitigating the effects of income shocks on educational

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<sup>2</sup> Self-help groups are informal associations whose members have some strong social cohesion that is built on friendship, neighbourhood, workers of the same institutions or same sector in a locality, or people of the same social background. They operate on mutual insurance kind of—as long as there is potential for reciprocity, it is easier to maintain them. SACCOs are member-owned institutional models entrusted to provide financial services to members. Members are simultaneously owners and users (Abay et al. 2017).

<sup>3</sup> The government has played a key role in urging people to establish SACCOs.

investment. This potential role has not been researched. This paper fills this void in the literature.

The paper proceeds as follows. “Tanzania’s education system” section provides a brief explanation on Tanzania’s education system. “Data and descriptive statistics” section describes the data and descriptive statistics. The estimation strategy is discussed in “Estimation strategy” section. “Estimation results” section presents and discusses the empirical results. “Conclusion and policy implications” section concludes and provides policy recommendations.

## Tanzania’s education system

In Tanzania, the structure of formal education system is 7+4+2+3+—7 years of primary education, 4 years of lower secondary education, 2 years of advanced secondary education and at least 3 years of tertiary education.<sup>4</sup> The age at entry to primary school is 7 years; primary education is compulsory to all children aged 7–13 years.<sup>5</sup> The primary school education ends with standard seven national examination. The lower secondary education begins with Form 1 and ends with Form 4. To be eligible for selection and enrolment to Form 1 in both government and private secondary schools, one has to pass the standard seven national examination. The advanced secondary education has Form 5 and 6. Selection and enrolment into Form 5 in government and private schools is based on performance in the relevant A-Level subject combinations after attaining appropriate credits in the Certificate of Secondary Education Examination. Form 4 and Form 6 examinations mark completion of secondary education. The results of these examinations are used for selection of students to join further formal education and training.

In terms of educational financing, since 2015 the government has been implementing fee-free education policy to all pupils in public primary and lower secondary schools<sup>6</sup> (see Government Circular No. 5 (URT 2015a)). The implementation of the policy indicates that access to primary and secondary education has greatly increased. For example, enrolment in Standard I–VII has increased by 8.5% from 9,317,791 in 2017 to 10,111,671 pupils in 2018. The increase becomes even higher when one looks at Standard I alone; enrolment increased from 1,568,378 in 2015 to 2,120,667 in 2016—an increase of 35.2% (URT 2018). Notwithstanding the achievements in terms of access and quality of education, more needs to be done. For example, national dropout rate is still relatively high at 0.7% of the total enrolment. Moreover, gross completion and net completion rate are not very impressive. For example, in 2017 only about 28.4% (net completion) of 13-year-old children reached Standard VII; gross completion rate was 71.1% (URT 2018).

Moreover, while the implementation of the fee-free education policy has undoubtedly reduced a greater portion of burden to parents whose children are attending public schools, poor households may still be unable to cover other school expenses, especially when they

<sup>4</sup> Prior joining Standard I, children have to complete 1–3 years of pre-primary education.

<sup>5</sup> This is the official age as per the 1995 Tanzania Education Policy (United Republic of Tanzania (URT) 2018)).

<sup>6</sup> Following the policy statement on fee-free basic education as stipulated in the Education and Training Policy of 2014 (URT 2014), the Government Circular No. 5 (URT 2015a) was issued to formalize the government’s commitment to providing fee-free basic public education.

experience shocks.<sup>7</sup> Indeed, the introduction of the fee-free policy in public schools has not stopped out of pocket payment from parents. Several noteworthy financial and material contributions are still imposed on parents including, uniforms, transport, extra tuition fee, books and other learning materials, cost of meals for some day schools, mattress, bed-sheets, and personal hygiene materials for boarding schools' pupils and for those staying in government-owned hostels (see Government Circular No. 6 (URT 2015b)).<sup>8</sup> Indeed, when they experience shocks, parents may fail to afford these school expenses. In fact, it has been observed that the leading cause for truancy among school children is lack of basic needs (URT 2018), which may be exacerbated by income shocks.

## Data and descriptive statistics

### Data

I use data from Tanzania National Panel Survey (NPS). The NPS is part of the Living Standards Measurement Study-Integrated Surveys on Agriculture (LSMS-ISA).<sup>9</sup> The NPS was designed and implemented by the Tanzania National Bureau of Statistics (NBS).<sup>10</sup> Among other key objectives, NPS was designed to monitor the National Strategy for Growth and Poverty Reduction (NSGPR) and to facilitate better understanding of the determinants of poverty reduction in Tanzania. The NPS was based on a stratified, multi-stage cluster sample design. The sample design has four analytical strata—Dar es Salaam, other urban areas in Mainland, rural areas in Mainland and Zanzibar. The principle strata were Tanzania Mainland and Zanzibar, and within these two strata, rural versus urban areas, with a special stratum set aside for Dar es Salaam.<sup>11</sup> This stratification was designed purposely to allow disaggregation between Dar es Salaam, other mainland urban areas, mainland rural areas, and Zanzibar. The sample was constructed based on the National Master Sample frame, which is a list of all populated enumeration areas in the country developed from the 2002 Population and Housing Census. At the beginning in 2008/2009, the NPS targeted to interview 3280 households spanning all regions and districts of Tanzania in 410 enumeration areas (randomly selected from the four strata). This sample size was calculated to be sufficient to produce national estimates of poverty and other indicators. To get the targeted sample, eight households were randomly chosen from each of the 410 enumeration areas.

<sup>7</sup> Fortunately, we have one wave conducted in 2019/2020 after the introduction of the fee-free policy. We use this data to check what the situation is after the introduction of the policy.

<sup>8</sup> The data shows that nonfees account for 85% of the education expenditure and fee takes only 15%. In the data, the costs that parents incur (other than school fee) include books, uniforms, transport, extra tuition, other contributions, and cost of meals. The components and their average expenditure are shown in Table 8.

<sup>9</sup> LSMS-ISA supports governments in seven Sub-Saharan African countries to generate nationally representative, household panel data with a strong focus on agriculture and rural development.

<sup>10</sup> The NBS was advised on technical issues related to survey design and implementation by experts from World Bank, DFID, UNICEF, UNFPA, and JICA. It also received management and technical support from the LSMS Team in the Development Economics Research Group of the World Bank.

<sup>11</sup> Tanzania is the union of Zanzibar and the then Tanganyika (now Tanzania Mainland); Dar es Salaam is the largest business city. Therefore, one would be interested to analyse these strata separately on top of urban versus rural analysis.

The NPS data has detailed information on education including currently schooling household members. For each of the schooling household member, the questionnaires also collected information on education expenditure such as school fees, uniforms, transport, extra tuition, cost of meals, books and other contributions. The surveys also elicited information on household's experience of shocks by using the following survey question: *Over the past 5 years, was the household severely affected negatively by the following events?*<sup>12</sup> In addition, there were two follow-up questions: *whether the shock caused a reduction in household income*; and, *in which year did the shock occur?* I use this information to create a recent<sup>13</sup> exposure to negative income shock variable.<sup>14</sup>

The survey questionnaires also elicited information on membership in SACCOs. In addition, the questionnaires collected information on persons or institutions from whom any household member borrowed or took credit in the last 12 months. I use this information to create a dummy variable for membership in self-help groups, which takes a value of 1 if the household borrowed or took credit from friends, neighbours or self-help groups and 0 otherwise. The data also contain detailed information on demographic characteristics and expenditure—both food and non-food expenditure. The latter is used to calculate the share of education expenditure to total expenditure.

<sup>12</sup> The list of the events is given in footnote 15.

<sup>13</sup> In this paper, a recent shock is any shock that occurred in the past 24 months. I use information on timing of the shocks to create lagged (past) income shock variables, which I use to check whether past income shocks affect current educational investment.

<sup>14</sup> The data contain different types of shocks—drought or floods, crop disease or crop pests, loss of livestock, household business failure, loss of salaried employment or non-payment of salary, large fall in sale prices for crops, large rise in price of food, large rise in agricultural input prices, severe water shortage, loss of land, chronic illness or accident of household member, death of a household member, death of other family member, break-up of the household, jailed, fire, robbery/burglary, and dwelling destroyed. Because each of these counts for a small percentage (Table 9), none of them can in isolation provide an extensive picture of the shocks households experience. Besides, if I were to focus on one specific shock, I would remain with a small sample size. That is why I combine them and look at the dummy of whether the shocks led to income loss. The extent of income loss would have been well captured if information on amount of income lost was available. Unfortunately, this is not available. The dummy variable I use, however, has some advantages. First, the sample consists of rural and urban households. For the former, agriculture is the main economic activity. Common shocks rural households face are drought, floods, crop disease or pests, loss of livestock, large fall in sale prices for crops, large rise in agricultural input prices, severe water shortage and loss of land which in turn reduce household income. Regarding urban households, common shocks they experience include business failure, loss of salaried employment or non-payment of salary and large rise in price of food. Therefore, the dummy variable I use allows me to get a comprehensive picture of the effect of income shock regardless of the type of the shock. Although the shocks listed above are not homogenous, they have one thing in common—they can lead to loss in household income—the main focus of the paper. However, for robustness check I differentiate the shocks by grouping them into three main categories—agricultural-related shocks (crop disease or pests, loss of livestock, large fall in sale prices for crops and large rise in agricultural input prices); weather-related shocks (drought or floods and severe water shortage); and, health-related shocks (chronic/severe illness or accident of household member, death of a member of household and death of other family member). We ignore minor shocks that affected only a few households.



The NPS data consist of five survey rounds—2008/2009, 2010/2011, 2012/2013, 2014/2015 and 2019/2020. In this paper, I use 2008–2009 and 2012–2013 waves.<sup>15</sup> The first round surveyed 3265 households between October 2008 and September 2009. The third round was from October 2012 to November 2013. It revisited the households interviewed during the first two rounds of 2008/2009 and 2010/2011 plus split-off households added into the sample in the second round. Consequently, the total sample at the start of the third round consisted of 3924 target households. Any households or eligible household members that had either moved or split away from the primary household were tracked and interviewed in their new location. The resulting sample size for the third round including NPS 2008/2009 and NPS 2010/2011 households plus new or split-off households in NPS 2012/2013 is 5010 households.<sup>16</sup> During the third round, 3122 households of the original sample were successfully traced. This gives an attrition of 4.4%, a very low attrition rate to cause any attrition bias.

In this paper, the outcome variables are per school-age child educational expenditure and budget share of education. To construct these variables, I exclude households with no child aged 7–19 years and assign zero educational expenditure to households who do not report any educational expenses but have at least one child aged 7–19 years. This reduces the sample to 1496 households, equivalent to a balanced panel of 2992 observations.<sup>17</sup> I use this data in the main analysis.

## Descriptive statistics

Table 1 reports the summary statistics by year. A total of 25% and 24% of households were headed by females in 2008 and 2012, respectively. The average household head's age increased from 47 in 2008 to 49 years in 2012. Similarly, the proportion of household heads who completed at least primary school increased from 56% in 2008 to 59% in 2012. The average household size was 6.2 and 6.4 in 2008 and 2012, respectively. On average, there were 2.4 and 2.5 children of school age in a household in 2008 and 2012, respectively. The budget share of education in both rounds remained at 4%. Per school-age child educational expenditure in 2008 was only 48,856 TZS and rose to 76,225 TZS in 2012.<sup>18</sup> We note that

<sup>15</sup> However, I do not use the 2010/2011 wave because community data has no cluster (enumeration area) id. Likewise, I do not use the 2014/15 wave because it has different sampling frame—after the Population and Housing Census of 2012, the sample in the 2014–2015 wave was refreshed to take into account any changes in administrative boundaries, demographic shifts, or updated population information. The sampling frame of the earlier three waves was the 2002 Population and Housing Census. Also, I do not use the 2019/2020 wave in the main analysis because its sample is smaller than the previous waves. It targeted only a subsample of households from the initial NPS cohort originating in 2008/09 and subsequently surveyed in all four consecutive rounds. This consisted of 989 households from the 2014/15 sample to be tracked and interviewed in 2019/20. It also included complete households that could not be interviewed in 2014/15, *excluding* those households that had refused to be interviewed in 2014/15. This constituted an additional 8 households.

<sup>16</sup> Since I use balanced panel data, I only use the original sample households and exclude new and split-off households.

<sup>17</sup> In total, 1800 observations of original balanced panel data (6244) have no any school-age child. In 2008 and 2012, a total of 978 and 813 households had no any school-age child, respectively. All these households were excluded. Moreover, because a household may have a school-age child in one round and not the other, I drop such households in order to remain with a balanced panel of households with at least one child of school age in both rounds.

<sup>18</sup> For more insights on the extent of household expenditure on education, Table 10 shows education expenditure by wealth status. Exchange rate 1 USD = 2310 TZS.



about 70% of the sampled households live in rural areas. Regarding exposure to shocks, 33% and 29% of the households reported to have experienced a recent income shock in 2008 and 2012, respectively. With regard to availability of education service, communities with government primary schools increased from 75% in 2008 to 90% in 2012. Similar trends are observed for communities with: private primary schools, government secondary schools and private secondary school. Similarly, we note an increase in communities with SACCOs over time.

## Estimation strategy

To examine whether income shocks reduce educational investment, I estimate the model in Eq. (1). I treat the income shock variable as exogenous to the household. However, any endogeneity arising from omitted variable problem or reverse causality could bias the estimates (Wooldridge 2010). I address the omitted variable problem by controlling for a number of household and community characteristics along with household fixed effects model<sup>19</sup> and region-time fixed effects. Controlling for household fixed effect helps to eliminate estimation bias caused by unobserved time-invariant household-specific characteristics that may be correlated with both the outcome variable and explanatory variable of interest (Wooldridge 2010). The inclusion of region-time fixed effects intends to clean the estimates of time trends or regional bias by soaking up endogenous spatial variation. To this end, a benchmark specification relating income shocks to educational investment is as follows.

$$Y_{ijrt} = \alpha_0 + \alpha_1 \text{Shock}_{it} + \alpha_2 X_{it} + C_{jt} + \varphi_i + \gamma_{rt} + \varepsilon_{ijrt} \quad (1)$$

where  $i$ ,  $j$ , and  $t$  stands for household, enumeration area, survey round, and region, respectively;  $Y$  is a measure of educational investment—per school-age child educational expenditure or the budget share of education of household  $i$ . Shock is a dummy indicating whether the household recently experienced income shock.  $\alpha_1$  is a parameter of interest capturing the impact of the income shock on measures of educational investment. I expect income shock to reduce educational investment.  $X$  is a set of household-level time-variant characteristics such as gender of household head, household head's age, whether the head completed at least primary school, household size, assets holding, number of school-age children, per capital income and whether the household resides in rural. All these may influence educational investment in different ways. For example, household head's schooling level, asset holdings and per capita income are expected to be positively associated with educational investment, whereas female-headed households are expected to spend less on education because they are likely to be more financially constrained. In  $X$ , I also control for whether over the past 12 months the household borrowed from other sources other than self-help groups, whether received any remittances, and whether received any group assistance (SACCOs and self-help groups, exclusive). Educational investment may

<sup>19</sup> I prefer the fixed effect model over random effect model because the latter makes assumes that individual characteristics that remain constant over time (time-invariant characteristics) are uncorrelated with explanatory variables for every  $t$ . This is very a strong assumption, and if it fails to hold, random estimator is inconsistent. Fixed effects estimation allows time-invariant characteristics to be correlated with explanatory variables. Its key assumption is that any unobserved time-invariant household characteristics that may cause bias to our estimates will be cancelled out.

**Table 1** Summary statistics

Variable	Year = 2008		Year = 2012		Mean difference
	Mean	SD	Mean	SD	
<b>Household-level</b>					
1 if female-headed household	0.25	0.44	0.24	0.43	0.01
Household head's age	46.80	14.18	49.22	14.10	-2.42***
1 if head completed primary school	0.56	0.50	0.59	0.49	-0.02
Household size	6.18	2.79	6.44	2.96	-0.26***
Number of school-age children	2.41	1.44	2.45	1.44	-0.03
# of children attending government schools	1.63	1.30	1.59	1.23	0.04
# of children attending private schools	0.13	0.48	0.15	0.46	-0.02
Share of education expenditure	0.04	0.06	0.04	0.07	-0.00*
1 if rural household	0.70	0.46	0.71	0.45	-0.01
1 if recently experienced income shock	0.33	0.47	0.29	0.45	0.04**
1 if member in SACCOs	0.07	0.26	0.07	0.26	0.00
1 if member in self-help groups	0.03	0.16	0.04	0.20	-0.01**
Per school-age child education expenditure	48,856	157,428	76,225	236,319	-27,369***
Per capita expenditure	513,753	432,236	724,905	594,576	-211,200***
<b>Community-level</b>					
1 if there is SACCOs	0.28	0.45	0.36	0.48	-0.09***
1 if there is government primary school	0.75	0.43	0.90	0.30	-0.15***
1 if there is private primary school	0.08	0.28	0.12	0.33	-0.04***
1 if there is government secondary school	0.32	0.47	0.49	0.50	-0.18***
1 if there is private secondary school	0.08	0.27	0.12	0.33	-0.04***
Observations	1496		1496		

also depend on past savings. To account for this, I control for whether the household has a bank account, a proxy for past savings and possibly past income.  $C$  is set of community-level time-variant characteristics including presence of government primary schools, private primary schools, government secondary schools, or private secondary schools. The presence of schools within a community has a potential to increase households' awareness on education and their incentive to invest more on it. However, the absence of schools may also increase school expenses such as transport costs.  $\varphi_i$  is household fixed effects and  $\gamma_{rt}$  is region specific time trend.  $\mathcal{E}$  is the error term that may be heteroskedastic and correlated within the community. To account for intra-cluster correlation, I use robust standard errors clustered at the community-level (Angrist and Pischke 2009; Cameron and Miller 2015). For comparative purposes, I run the same regression separately for five different age groups—7–19 years (primary to advanced secondary age group combined), 7–17 years (primary to lower secondary age group), 14–19 years (lower to advanced secondary age group), 7–13 years (primary school age group), 14–17 years (lower secondary age group), and 18–19 years (advanced secondary age group).

Next, in Eq. (2), I examine whether self-help groups and SACCOs can cushion households against income shocks. That is, I examine whether the effect of income shocks varies with household's membership in self-help groups or SACCOs. I include a broad range of controls. One concern is that membership in self-group or SACCOs could be correlated

with omitted variables arising from unobserved time-invariant household characteristics such as social networks (Cooper and Rege 2011; Bursztyrn et al. 2014; Newman et al. 2014; Murendo et al. 2017) and risk averseness or risk loving. These are also likely to be correlated with educational investment (Belzil and Leonardi 2007; Chechi et al. 2014; Tabetando 2018). Therefore, if not controlled, the estimates will be biased. I address this concern by exploiting the panel nature of the data and use household fixed effects. Household fixed effects should help to purge these unobserved time-invariant household characteristics that could confound our results.

$$Y_{ijrt} = \alpha_0 + \alpha_1 \text{Shock}_{it} + \alpha_2 \mathbf{SG}_{it} + \alpha_3 (\text{Shock}_{it} * \mathbf{SG}_{it}) + \alpha_4 X_{it} + C_{jt} + \varphi_t + \gamma_{rt} + \varepsilon_{ijrt} \quad (2)$$

where  $\mathbf{SG}$  is set of two dummies—membership in a self-help group and membership in SACCOs. The remaining variables are as defined earlier in Eq. (1).  $\alpha_3$  is a parameter of interest which is expected to be positive and statistically significant if membership in self-help group or SACCOs mitigates the effect of income shocks on educational investment. Although my interest is on self-help groups and SACCOs membership as sources of credit, in  $X$ , I also control for availability of credit from other formal and informal sources. This is done by using a dummy equal to 1 if over the past 12 months the household borrowed from any formal or informal sources (other from self-help groups and SACCOs).<sup>20</sup>

Although our income shock variable is arguably exogenous to the households, together with the fact I use the household effects model with region-year specific effects to remove any endogeneities arising from omitted variable problem, a concern may arise that households who spend less on schooling (poor households) may be more likely to be exposed to income shocks (Morduch 1994).<sup>21</sup> Put differently, past educational investments might affect parents' current exposure to income shocks. If this is the case, the estimates may suffer from endogeneity problem arising from reverse causality. To check whether reverse causality can be a genuine concern, I mimic Beegle et al. (2006) strategy and examine whether past educational investment predicts which households experience income shock (Eq. (3)). If it turns out that the null hypothesis cannot be rejected,  $\sigma Y_{it-1} = 0$ , this would imply that households who spend less on education are more likely to experience income shock.

$$\text{Shock}_{ijrt} = 1 \{ \kappa + \sigma Y_{it-1} + \lambda X_{it} + \eta_{ijrt} > 0 \} \quad (3)$$

where  $Y_{it-1}$  is lagged per school-age child educational expenditure or lagged budget share of education.  $\eta_{ijrt}$  is the error term. The remaining variables are as defined earlier in Eq. (1).

<sup>20</sup> Sources mentioned by respondents include commercial banks, micro-finance institution, insurance companies, building societies, local merchant, money lender, employer, religious institution, and NGOs.

<sup>21</sup> However, reverse causality is unlikely here because households generally do not experience shocks because they spent less in their children's schooling.

## Estimation results

### Are income shocks exogenous to educational investment?

I begin by exploring whether income shocks are plausibly exogenous with parents educational investment in their children. I do so by regressing current income shocks on past educational investment and other household characteristics (Eq. (3)). The main interest is to see whether past educational investments affect parent's current exposure to income shocks. The results are reported in Table 2. Across all four columns, I find that conditional on some household characteristics, all four measures of past educational investment are not significantly correlated with current income shock at any standard levels. Turning to household characteristics, I find that with the exception of household size, which is positively correlated with income shock at the acceptable significance levels (columns 1 and 3)—I include household size as a controlled in Eqs. (1) and (2), the remaining household characteristics are insignificantly correlated with current income shock. The insignificant correlation between past educational investment and current income shock rules out the possibility of endogeneity arising from reverse causality and support a causal interpretation of the effect of income shock on educational investment.

### Income shock and educational investment

In this sub-section, I examine whether income shock affect educational investment. I estimate Eq. (1) and report the estimation results in Table 3. I use four different measures of parental investment in the education of their children: per school-age educational expenditure (primary to advance secondary education), per school-age educational expenditure (primary to lower secondary education), per school-age educational expenditure (lower to advance secondary education), and budget share of educational expenditure, in columns (1)–(4), respectively. In all specifications, I control for a bunch of household-and community-level characteristics and include household fixed effects together with region-year fixed effects. In all columns, I find a decrease in educational investment. The coefficients remain robust in sign and are consistently significant at the 1% level, except in column 4. The results in columns (1)–(3) suggest that households who are exposed to income shocks invest in the education of their children between 44 to 48 percentage points lower than those unexposed to shocks. To further test the robustness of the results, I estimate the subsamples of primary school-age children, lower secondary school-age children, and advanced secondary school-age children.

The results reported in Table 11 are largely similar to the main results in Table 3. In fact, for the restricted per lower secondary school-age and per advanced secondary school-age educational expenditure subsamples, the effect is substantially large: income shock is associated with a 56–64% decrease in per school-age educational expenditure. The results presented in Table 3 corroborate the findings of other existing studies (see, Dasgupta and Ajwad 2011; Mottaleb et al. 2013, 2015). Mottaleb et al. (2013), for example show that the Bangladesh cyclone forced the affected households to reduce their expenditures on children's education due to the income losses. The results reported in Table 3, however, are in contrast with the findings of Garbero and Mutarak (2013) and Khalili et al. (2020).

It is also worth mentioning that income shocks may have different impact at different income levels. I explore this possibility by interacting the income shock variable with

**Table 2** Past educational investment and current income shock

	(1)	(2)	(3)	(4)
Dependent variable: <i>1 if recently experienced income shock</i>				
Log lagged per school-age educational expenditure (7–19 years)	–0.002 (–0.283)			
Log lagged per school-age educational expenditure (7–17 years)		0.001 (0.167)		
Log lagged per school-age educational expenditure (14–19 years)			0.001 (0.076)	
Past budget share of education				0.097 (0.490)
1 if female-headed household	0.021 (0.670)	0.023 (0.695)	–0.041 (–0.875)	0.021 (0.654)
Household head's age	–0.001 (–1.098)	–0.001 (–1.028)	–0.001 (–0.856)	–0.001 (–1.095)
1 if head completed primary school	0.001 (0.021)	0.010 (0.327)	–0.053 (–1.122)	0.001 (0.026)
Household size	0.010** (2.545)	0.010** (2.540)	0.005 (0.704)	0.010** (2.553)
Asset index	–0.002 (–0.240)	–0.004 (–0.589)	–0.010 (–1.086)	–0.001 (–0.209)
Constant	0.518*** (4.435)	0.449*** (3.646)	0.610*** (3.700)	0.506*** (4.572)
Observations	1490	1346	636	1490
R-squared	0.069	0.068	0.099	0.070
Year dummy	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Regional dummies	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

Robust *t* statistics in parentheses

\*\*\*, \*\* Significant at 1% and 5% level, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–19 years). This age group is supposed to be in primary school to advance secondary school. In column 2, per school-age educational expenditure covers children between (7–17 years). This age group is supposed to be in primary to lower secondary school. In column 3, per school-age educational expenditure covers all children between (14–19 years). This age group is supposed to be in lower secondary and advanced secondary school. In columns (1)–(3), the outcome variables are in log

different wealth quintiles groups<sup>22</sup> and present the results in Table 3. Indeed, I find that the effect of income shock is more severe to the “poorest of the poor” than to somewhat well-off and wealthy households.

For robustness check, I also differentiate the shocks experienced by households by grouping them into three main categories—agricultural-related shocks, weather-related shocks, and health-related shocks and report the results in Table 12. Overall, the results

<sup>22</sup> I use household per capita expenditure to categorize households into four quintiles: very poor, poor, moderate, and rich: The household is categorized as very poor if its per capita expenditure is less or equal to 25 percentile, poor if it is above 25 percentile but less or equal to 50 percentile, moderate if it is above 50 but less or equal to 75 percentile, and rich if it is above 75 percentile. To understand the differential impact of negative shock at different income levels, I interact the income shock variable with the wealth status variables.

**Table 3** Income shock and educational investment

	(1)	(2)	(3)	(4)
	Per school-age educational expenditure (7–19 years)	Per school-age educational expenditure (7–17 years)	Per school-age educational expenditure (14–19 years)	Budget share of education
1 if recently experienced income shock	-0.470*** (-3.967)	-0.443*** (-3.944)	-0.478*** (-2.693)	-0.001 (-0.359)
Shock × poor household <sup>a</sup>	0.546*** (4.229)	0.362*** (2.997)	0.442** (2.163)	-0.010** (-2.425)
Shock × moderate household	0.509*** (3.340)	0.350** (2.341)	0.587*** (2.614)	-0.012*** (-2.688)
Shock × rich household	0.843*** (4.459)	1.115*** (5.850)	0.891*** (2.957)	-0.002 (-0.255)
1 if female-headed household	0.126 (1.404)	-0.009 (-0.095)	-0.048 (-0.314)	0.007** (2.306)
Household head's age	0.016*** (5.688)	0.011*** (4.002)	0.011** (2.261)	0.006*** (2.891)
Household size	-0.030* (-1.720)	-0.029* (-1.736)	-0.025 (-0.895)	0.002 (1.621)
1 if head completed primary school	0.530*** (6.555)	0.426*** (5.590)	0.517*** (3.606)	0.005* (1.889)
Number of school-age children (7–19 years)	0.284*** (8.394)	0.202*** (6.554)	0.273*** (5.194)	0.000 (0.710)
Log per capita income	0.024* (1.770)	0.037*** (2.883)	0.003 (0.113)	0.001* (1.827)
1 if over the past 12 months borrowed (other than from self-help groups and SACCOs)	0.101 (0.710)	-0.130 (-0.885)	0.594** (2.146)	0.009 (1.387)
1 if household has a bank account	0.389*** (3.454)	0.303*** (2.835)	0.427*** (2.334)	0.017*** (4.297)
Asset index	0.183*** (6.975)	0.166*** (6.290)	0.148*** (3.264)	0.010*** (14.485)
1 if household received remittances	0.122 (1.473)	0.083 (1.067)	0.369*** (2.832)	0.004 (1.284)

Table 3 (continued)

	(1)	(2)	(3)	(4)
	Per school-age educational expenditure (7–19 years)	Per school-age educational expenditure (7–17 years)	Per school-age educational expenditure (14–19 years)	Budget share of education
1 if received group assistance (other than from self-help groups and SACCOs)	-0.156 (-1.402)	-0.196* (-1.682)	-0.095 (-0.473)	0.007 (1.196)
1 if rural household	-0.541*** (-5.431)	-0.527*** (-5.580)	-0.616*** (-3.400)	-0.009** (-2.494)
1 if there is govt. primary school within the community	-0.253** (-2.299)	-0.109 (-1.008)	-0.305 (-1.521)	-0.003 (-0.847)
1 if there is private primary school within the community	0.111 (0.727)	0.263* (1.695)	0.184 (0.638)	-0.007 (-1.159)
1 if there is govt. secondary school within the community	0.222*** (2.837)	0.137* (1.855)	0.386*** (2.855)	0.006** (1.970)
1 if there is private secondary school within the community	-0.005 (-0.031)	0.101 (0.710)	-0.016 (-0.060)	0.016*** (2.835)
Constant	7.398*** (11.760)	8.399*** (14.428)	4.277*** (4.022)	-0.094*** (-4.829)
Observations	2992	2702	1274	2992
Number of households	1496	1351	637	1496
R-squared	0.275	0.276	0.263	0.230
Household fixed effects	Yes	Yes	Yes	Yes
Year × regional dummies	Yes	Yes	Yes	Yes

\*\*\*, \*\*, \*Significant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–19 years). This age group is supposed to be in primary school to advance secondary school. In column 2, per school-age educational expenditure covers children between (7–17 years). This age group is supposed to be in primary to lower secondary school. In column 3, per school-age educational expenditure covers all children between (14–19 years). This age group is supposed to be in lower secondary and advanced secondary school. In columns (1)–(3), the outcome variables are in log

<sup>a</sup>The base category is shock × very poor household. Robust *t* statistics in parentheses



**Table 4** Self-help groups and SACCOs in cushioning against income shocks

	(1)	(2)	(3)	(4)
	Per school-age educational expenditure (7–19 years)	Per school-age educational expenditure (7–17 years)	Per school-age educational expenditure (14–19 years)	Budget share of education
1 if recently experienced income shock	-0.501*** (-4.154)	-0.485*** (-4.290)	-0.516*** (-2.797)	-0.005 (-1.234)
1 if member in self-help groups	-0.344 (-1.043)	-0.605* (-1.861)	0.543 (0.813)	-0.015 (-1.251)
1 if member in SACCOs	0.146 (0.881)	0.053 (0.357)	-0.225 (-0.677)	0.006 (0.942)
Shock × membership in self-help groups	0.304 (0.663)	0.301 (0.699)	-0.491 (-0.636)	-0.005 (-0.292)
Shock × membership in SACCOs	0.254 (0.919)	0.389* (1.678)	0.582 (1.183)	0.019* (1.867)
Shock × poor household <sup>a</sup>	0.552*** (4.253)	0.362*** (2.970)	0.450** (2.193)	-0.008* (-1.940)
Shock × moderate household	0.488*** (3.184)	0.327** (2.179)	0.544** (2.415)	-0.013*** (-2.953)
Shock × rich household	0.821*** (4.293)	1.080*** (5.718)	0.847*** (2.830)	-0.001 (-0.178)
1 if female-headed household	0.126 (1.399)	-0.010 (-0.111)	-0.036 (-0.232)	0.005* (1.696)
Household head's age	0.016*** (5.674)	0.011*** (3.952)	0.011** (2.251)	0.000*** (2.791)
Household size	-0.030* (-1.745)	-0.030* (-1.839)	-0.023 (-0.850)	-0.001** (-2.166)
1 if head completed primary school	0.514*** (6.313)	0.412*** (5.408)	0.503*** (3.452)	0.002 (0.767)
Number of school-age children (7–19 years)	0.285*** (8.332)	0.202*** (6.509)	0.269*** (5.137)	0.009*** (8.352)
Log per capita income	0.023* (1.731)	0.036*** (2.844)	0.005 (0.192)	0.001 (1.515)

Table 4 (continued)

	(1)	(2)	(3)	(4)
	Per school-age educational expenditure (7–19 years)	Per school-age educational expenditure (7–17 years)	Per school-age educational expenditure (14–19 years)	Budget share of education
1 if over the past 12 months borrowed (other than from self-help groups and SACCOs)	0.072 (0.502)	-0.158 (-1.051)	0.583** (2.174)	0.007 (1.072)
1 if household has a bank account	0.385*** (3.396)	0.306*** (2.829)	0.449** (2.434)	0.018*** (4.639)
Asset index	0.179*** (6.807)	0.162*** (6.091)	0.148*** (3.230)	0.009*** (14.440)
1 if household received remittances	0.116 (1.417)	0.078 (1.018)	0.345** (2.582)	0.003 (1.130)
1 if received group assistance (other than from self-help group and SACCOs)	-0.156 (-1.427)	-0.192* (-1.682)	-0.086 (-0.437)	0.007 (1.354)
1 if rural household	-0.540*** (-5.408)	-0.531*** (-5.617)	-0.627*** (-3.436)	-0.009** (-2.453)
1 if there is govt. primary school within the community	-0.275** (-2.495)	-0.123 (-1.135)	-0.304 (-1.556)	-0.006 (-1.417)
1 if there is private primary school in the community	0.101 (0.660)	0.255 (1.648)	0.160 (0.558)	-0.009 (-1.533)
1 if there is govt. secondary school in the community	0.226*** (2.860)	0.145* (1.952)	0.368*** (2.771)	0.006* (1.901)
1 if there is private secondary school in the community	0.008 (0.047)	0.112 (0.787)	-0.007 (-0.027)	0.018*** (3.327)
Constant	7.474*** (11.824)	8.402*** (14.347)	4.401*** (4.151)	-0.110*** (-5.670)
Observations	2992	2702	1274	2992
Number of households	1496	1351	637	1496
R-squared	0.276	0.279	0.265	0.251
Household fixed effects	Yes	Yes	Yes	Yes

**Table 4** (continued)

	(1)	(2)	(3)	(4)
Year × regional dummies	Per school-age educational expenditure (7–19 years) <i>Yes</i>	Per school-age educational expenditure (7–17 years) <i>Yes</i>	Per school-age educational expenditure (14–19 years) <i>Yes</i>	Budget share of education <i>Yes</i>

\*\*\*, \*\*, \*Significant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–19 years). This age group is supposed to be in primary school to advance secondary school. In column 2, per school-age educational expenditure covers children between (7–17 years). This age group is supposed to be in primary to lower secondary school. In column 3, per school-age educational expenditure covers all children between (14–19 years). This age group is supposed to be in lower secondary and advanced secondary school. In columns (1)–(3), the outcome variables are in log

<sup>a</sup>The base category is shock × very poor household. Robust *t* statistics in parentheses

reported in Table 12 indicate that income shock resulting from weather-related shocks is more harmful to educational investment than income shock resulting from agricultural- or health-related shocks. The results are not surprising, weather-related shocks such as drought and severe water shortage are likely to have adverse economic effects because they have severe negative implications on agriculture, the main economic activity of most households in rural areas.

### **Do self-help groups and SACCOs cushion against income shocks?**

I now turn to exploring whether self-help groups and SACCOs buffer the negative impact of income shocks (Eq. (2)). The results are reported in Table 4. The outcome variables are the same measures of educational investment used in Table 3. In all four columns, neither the coefficient of membership in self-help groups nor that of SACCOs membership is statically significant. The main interest, however, is to check whether the effect of income shock on educational investment is offset by membership in self-help groups or SACCOs. In columns 2 and 4 of Table 4, income shock-SACCOs membership interaction is statistically significant at 10% level, suggesting that SACCOs membership can cushion members against the effect of income shock on educational investment. However, these results are not robust (Table 13). On the whole, the results suggest that both self-help groups and SACCOs do not help members to cushion against the negative repercussions of income shock on the educational investment.

One plausible explanation for the above findings is that many of the shocks observed in the data such as drought, floods, crop diseases and large rise in agricultural input prices tend to affect almost all households in the community (see Tables 9 and 14). This may make it difficult for members to borrow or get assistance locally because each member is likely to be exposed to the same shocks and therefore in need of funds from the same sources.<sup>23</sup> As a result, households may not be insured against locally by these local channels—self-help groups or SACCOs; if insured, they may opt to allocate the little money obtained to smooth more pressing needs such as food consumption.

### **Are the impacts of income shock on educational investment persistent?**

In Table 5, I examine whether the effects of income shocks on educational investment are persistent. In order to do so, I use one-to-three year lagged income shock to examine whether exposure to past income shocks affect current educational investment. Except in column 4, where one-year lagged income shock is found to reduce the budget share of education at the 10% significance level, in the remaining columns none of the past income shocks is found to reduce educational investment at the acceptable significance levels. Overall, the results in Table 5 suggest that the effects of income shocks on educational investment revealed in Tables 3 and 4 are not persistent. That is, children whose parents are exposed to the income shocks this year may not necessarily be affected in their schooling

<sup>23</sup> This reasoning is supported by the data as shown in Table 14, which shows responses to survey question “how disperse was the shock?”. The responses indicate that 35.1% and 30.2% of the shocks affected only the responding household in 2008 and 2012, respectively. 10.2% and 13.2% of the shocks in 2008 and 2012 affected some other households in the community; 44.6% and 43.5% affected most of the households in the community in 2008 and 2012, respectively; and, 10.1% and 13.1% affected all households in the community in 2008 and 2012, respectively.

**Table 5** Persistence of the impact of income shocks on educational investment

	(1)	(2)	(3)	(4)
	Per school-age educational expenditure (7–19 years)	Per school-age educational expenditure (7–17 years)	Per school-age educational expenditure (14–19 years)	Budget share of education
1 if 1 year lagged income shock	0.048 (0.632)	0.084 (1.126)	0.096 (0.629)	-0.007** (-2.120)
1 if 2 year lagged income shock	0.285*** (2.691)	0.237** (2.121)	0.382** (2.072)	0.001 (0.257)
1 if 3 year lagged income shock	0.048 (0.341)	-0.188 (-1.352)	-0.238 (-0.958)	-0.007* (-1.785)
1 if member in self-help group	-0.059 (-0.258)	-0.385* (-1.734)	0.598 (1.272)	-0.015* (-1.675)
1 if membership in SACCOs	0.215 (1.456)	0.243* (1.824)	-0.016 (-0.055)	0.014*** (2.608)
1 if female-headed household	0.224** (2.244)	0.055 (0.533)	-0.048 (-0.267)	0.007** (2.337)
Household head's age	0.018*** (6.135)	0.013*** (4.367)	0.014** (2.550)	0.000*** (2.843)
Household size	-0.097*** (-4.096)	-0.147*** (-6.364)	-0.086** (-2.314)	0.002* (1.788)
1 if head completed primary school	0.642*** (7.466)	0.526*** (6.447)	0.605*** (3.720)	0.005* (1.660)
Number of school-age children (7–19 years)	0.007*** (3.175)	0.009*** (4.429)	0.009*** (3.078)	0.000 (0.545)
Log per capita income	0.031** (2.168)	0.045*** (3.336)	0.010 (0.356)	0.001 (1.640)
1 if over the past 12 months borrowed (other than from self-help groups and SACCOs)	0.064 (0.417)	-0.191 (-1.198)	0.683** (2.184)	0.007 (1.058)
1 if has a bank account	0.348*** (2.847)	0.290** (2.528)	0.423** (2.066)	0.017*** (4.219)
Asset index	0.197*** (7.197)	0.187** (6.744)	0.158*** (3.125)	0.009*** (14.556)
1 if has received any remittances in the last 12 months	0.136 (1.497)	0.093 (1.089)	0.404*** (2.658)	0.004 (1.181)

Table 5 (continued)

	(1) Per school-age educational expenditure (7–19 years)	(2) Per school-age educational expenditure (7–17 years)	(3) Per school-age educational expendi- ture (14–19 years)	(4) Budget share of education
1 if received group assistance (other than from self-help groups and SACCOs)	-0.192 (-1.634)	-0.206* (-1.699)	-0.163 (-0.731)	0.007 (1.252)
1 if rural household	-0.594*** (-5.499)	-0.569*** (-5.585)	-0.808*** (-3.954)	-0.009*** (-2.332)
1 if there is gov. primary school within the village	-0.267** (-2.277)	-0.129 (-1.113)	-0.311 (-1.440)	-0.005 (-1.294)
1 if there is private primary school within the village	0.146 (0.874)	0.302* (1.794)	0.189 (0.567)	-0.007 (-1.147)
1 if there is gov. secondary school within the village	0.277*** (3.285)	0.201** (2.526)	0.437*** (3.033)	0.007** (2.183)
1 if there is private secondary school within the village	-0.074 (-0.430)	0.054 (0.352)	-0.201 (-0.658)	0.016*** (2.906)
Constant	6.763*** (10.442)	8.063*** (13.421)	3.368*** (2.948)	-0.081*** (-4.101)
Observations	2992	2702	1274	2992
R-squared	0.233	0.252	0.228	0.230
Number of households	1496	1351	637	1496
Household fixed effects	Yes	Yes	Yes	Yes
Year X regional dummies	Yes	Yes	Yes	Yes

Robust *t* statistics in parentheses

\*\*\*, \*\*, \*Sjgnificant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–19 years). This age group is supposed to be in primary school to advance secondary school. In column 2, per school-age educational expenditure covers children between (7–17 years). This age group is supposed to be in primary to lower secondary school. In column 3, per school-age educational expenditure covers all children between (14–19 years). This age group is supposed to be in lower secondary and advanced secondary school. In columns (1)–(3), the outcome variables are in log

in the next three years, assuming that they do not experience any other income shock in those years. However, the fact that even temporary schooling interruptions have lasting negative implications (Jensen 2000), and given the importance of educational investments for human development, the negative effect of income shocks on educational investment presented in the previous Tables suggest that this should be an issue of concerned.

### **A glance at the situation post-2015: fee-free education policy era**

In Tables 3 and 4, by using the 2008/2009 and 2012/2013 waves of the Tanzania National Panel Survey data, I found a decrease in educational investment when households are exposed to income shocks. However, it is worth exploring whether the results obtained by using pre-fee-free educational policy data still hold post-2015. As mentioned earlier, in 2015 Tanzania introduced a fee-free education policy, which eradicated tuition fees for students in government primary and secondary schools. Because of the policy, education expenditure is likely not to suffer as much as it would have been in the absence of the policy. However, as I mentioned earlier, the advent of the fee-free policy has not stopped out of pocket payment from parents whose children are attending public schools. Several significant financial and material contributions are still imposed on parents including books and materials, uniforms, transport, extra tuition fee, and other contributions including cost of meals for some schools. Second, over the past decade, parents' preferences for private schools have been increasing. Fee-free policy has nothing to do with those pupils studying in private schools.

To shed light on the post-2015 situation, I examine the correlation between income shock and educational expenditure by using post-2015 data—NPS 2019/2020<sup>24</sup> (Table 6, see also Table 15). Overall, the estimation results tell a consistent story—income shock is negatively and statistically correlated with not only educational expenditure but also the budget share of education (Table 6—columns 1, 2 and 4).

In Table 7, I shed light on the role of self-help groups and SACCOs in cushioning households against the negative effect of income shocks on educational investment. Except in column 3, where a positive and statistically relationship is noted, in the remaining columns the coefficients are either positive but statistically insignificant or are negative. Overall, the results presented in Tables 7 and 16 show no any strong evidence to suggest that these associations do indeed cushion households against the effects of income shocks on educational investment.

### **Conclusion and policy implications**

Income shocks can have deleterious effects on parental investment in the education of the children, more so, when formal and insurance markets are incomplete, a key characteristic in developing countries. However, despite the lack of formal financial and insurance markets in many areas of Tanzania, when exposed to income shocks households may use a number of buffering mechanisms including self-help groups and SACCOs. This paper examined whether income shocks affect educational investment and whether self-help

<sup>24</sup> See the details of this wave in Footnote 16.



**Table 6** Income shock and educational expenditure during fee-free policy era

	(1)	(2)	(3)	(4)
	Per school-age educational expenditure (7–19 years)	Per school-age educational expenditure (7–17 years)	Per school-age educational expenditure (14–19 years)	Budget share of education
1 if recently experienced income shock	-0.744** (-2.462)	-0.740** (-2.523)	-0.513 (-1.572)	-0.013*** (-3.156)
Shock × poor household <sup>a</sup>	0.781* (1.894)	0.713* (1.732)	0.587 (1.224)	0.018** (2.187)
Shock × moderate household	0.837** (2.252)	0.815** (2.237)	0.779** (2.045)	0.018*** (2.591)
Shock × rich household	0.699* (1.876)	0.722* (1.914)	0.934** (2.213)	0.020** (2.128)
1 if female-headed household	0.325* (1.851)	0.402** (2.170)	0.130 (0.670)	0.006 (1.569)
Household head's age	-0.005 (-1.047)	-0.007 (-1.431)	0.001 (0.228)	-0.000 (-0.014)
Household size	-0.065* (-1.892)	-0.060* (-1.690)	-0.054 (-1.407)	-0.002*** (-3.014)
1 if head completed primary school	0.210 (1.454)	0.167 (1.112)	0.248 (1.605)	0.005 (1.256)
Number of school-age children (7–19 years)	0.167*** (2.594)	0.137** (2.088)	0.151** (2.247)	0.006*** (3.826)
Log per capita income	-0.024 (-0.685)	-0.038 (-1.005)	-0.041 (-0.921)	-0.000 (-0.145)
1 if over the past 12 months borrowed (other than from self-help groups and SACCOs)	0.742*** (2.620)	0.731*** (2.599)	0.440 (1.337)	0.006 (0.715)
1 if has a bank account	-0.175 (-0.883)	-0.097 (-0.477)	0.007 (0.030)	-0.002 (-0.483)
Log value of assets	0.253*** (5.267)	0.251*** (5.104)	0.193*** (3.417)	0.002** (2.032)
1 if received remittances in the last 12 months	0.327** (2.060)	0.320* (1.962)	0.315* (1.715)	0.003 (0.892)

Table 6 (continued)

	(1)	(2)	(3)	(4)
	Per school-age educational expenditure (7–19 years)	Per school-age educational expenditure (7–17 years)	Per school-age educational expenditure (14–19 years)	Budget share of education
1 if received group assistance (excluding self-help groups and SACCOs)	0.187 (0.631)	0.256 (0.834)	0.105 (0.318)	-0.000 (-0.0005)
1 if rural household	0.173 (1.175)	0.261* (1.710)	-0.023 (-0.142)	0.003 (0.968)
Constant	4.541*** (6.712)	4.897*** (6.970)	5.651*** (7.258)	-0.025 (-1.482)
Observations	664	623	410	664
R-squared	0.097	0.096	0.092	0.049

\*\*\*, \*\*, \*Significant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–19 years). This age group is supposed to be in primary school to advance secondary school. In column 2, per school-age educational expenditure covers children between (7–17 years). This age group is supposed to be in primary to lower secondary school. In column 3, per-school age educational expenditure covers all children between (14–19 years). This age group is supposed to be in lower secondary and advanced secondary school. In columns (1)–(3), the outcome variables are in log

<sup>a</sup>The base category is shock × very poor household. Robust *t* statistics in parentheses

**Table 7** Self-help groups and SACCOs in cushioning against income shocks: post-2015

	(1)	(2)	(3)	(4)
	Per school-age educational expenditure (7–19 years)	Per school-age educational expenditure (7–17 years)	Per school-age educational expenditure (14–19 years)	Budget share of education
1 if recently experienced income shock	-0.703** (-2.367)	-0.657** (-2.247)	-0.383 (-1.308)	-0.014** (-2.571)
1 if member in self-help groups	0.999** (2.063)	1.129** (2.138)	1.406*** (2.820)	0.016* (1.667)
1 if member in SACCOs	-0.440 (-1.244)	-0.367 (-0.963)	-0.492 (-1.427)	-0.005 (-0.883)
Shock × membership in self-help groups	1.090 (1.181)	1.022 (1.067)	2.832*** (3.931)	0.059 (1.133)
Shock × membership in SACCOs	-0.048 (-0.090)	-0.176 (-0.337)	0.114 (0.210)	-0.002 (-0.206)
Shock × poor household <sup>a</sup>	0.719* (1.709)	0.615 (1.456)	0.541 (1.124)	0.016* (1.847)
Shock × moderate household	0.783** (2.122)	0.740** (2.031)	0.721** (2.020)	0.016** (2.173)
Shock × rich household	0.641* (1.757)	0.646* (1.749)	0.747* (1.935)	0.018** (2.192)
1 if female-headed household	0.303* (1.751)	0.369** (2.034)	0.037 (0.205)	0.005 (1.442)
Household head's age	-0.003 (-0.705)	-0.006 (-1.138)	0.002 (0.406)	0.000 (0.646)
Household size	-0.064* (-1.830)	-0.059 (-1.628)	-0.048 (-1.215)	-0.002*** (-2.899)
1 if head completed primary school	0.242* (1.671)	0.195 (1.296)	0.272* (1.722)	0.006 (1.396)
Number of school-age children (7–19 years)	0.169*** (2.620)	0.139** (2.114)	0.142** (2.100)	0.006*** (3.793)
Log per capita income	-0.025 (-0.698)	-0.042 (-1.103)	-0.039 (-0.835)	-0.000 (-0.238)

Table 7 (continued)

	(1)	(2)	(3)	(4)
	Per school-age educational expenditure (7–19 years)	Per school-age educational expenditure (7–17 years)	Per school-age educational expenditure (14–19 years)	Budget share of education
1 if over the past 12 months borrowed (other than from self-help groups and SACCOs)	0.812*** (2.859)	0.807*** (2.858)	0.553* (1.695)	0.008 (0.937)
1 if has a bank account	-0.140 (-0.700)	-0.071 (-0.338)	0.064 (0.285)	-0.002 (-0.430)
Log value of assets	0.245*** (5.147)	0.240*** (4.938)	0.185*** (3.455)	0.002* (1.766)
1 if received remittances in the last 12 months	0.252 (1.567)	0.234 (1.420)	0.266 (1.453)	0.000 (0.117)
1 if received group assistance (excluding self-help groups and SACCOs)	0.190 (0.659)	0.249 (0.844)	0.053 (0.176)	0.001 (0.111)
1 if rural household	0.164 (1.121)	0.253* (1.666)	-0.029 (-0.184)	0.003 (0.937)
Constant	4.563*** (6.788)	4.997*** (7.210)	5.641*** (7.444)	-0.024 (-1.383)
Observations	664	623	410	664
R-squared	0.115	0.118	0.131	0.084

\*\*\*, \*\*, \*Significant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–19 years). This age group is supposed to be in primary school to advance secondary school. In column 2, per school-age educational expenditure covers children between (7–17 years). This age group is supposed to be in primary to lower secondary school. In column 3, per school-age educational expenditure covers all children between (14–19 years). This age group is supposed to be in lower secondary and advanced secondary school. In columns (1)–(3), the outcome variables are in log

<sup>a</sup>The base category is shock × very poor household. Robust *t* statistics in parentheses

groups and SACCOs can be useful mechanisms to cushion households against the income shocks.

I find that educational investment suffers when parents face income shocks. Specifically, I find that per school-age educational expenditure decrease with income shocks. I also find no strong evidence to suggest that self-help groups and SACCOs mitigate the effects of income shocks on educational expenditure. A key plausible explanation for the latter findings as observed from the data is that most of the shocks affect almost all households in the community. Consequently, each victim in the community is likely to chase funds from the same source, hence a competition for little loanable funds available. Subsequently, victims may end up not being able to borrow or get assistance from these locally based channels or may end up getting lower than they would have got in the absence of shocks. Second, because not only educational expenditure is affected by income shock, households are likely to use the little money obtained from the associations to smooth more pressing needs such as food consumption. Therefore, although I find no evidence regarding ability of self-help groups and SACCOs in cushioning households against income shocks, this does not rule out the possibility of these associations in insuring against shocks on other outcomes such as food consumption. However, this is beyond the scope of this study.

In terms of policy implications, human capital development is vital for a country's economic growth and development. The fact that income shocks reduce educational investment suggests that government should design and introduce policies to ensure access to and quality of education to all school-age children. Thanks to the newly introduced fee-free education policy whose implementation began in 2015. However, although this policy has reduced a portion of burden to parents whose children are attending public schools, it has not stopped out of pocket payment from parents including, uniforms, transport, extra tuition, books, other materials and contributions. Indeed, as shown in Tables 6 and 15, when parents are exposed to income shocks, educational expenditure still suffers in the fee-free policy era. Therefore, a lot more needs to be done. Second, the results suggest that locally available buffering mechanisms such as self-help groups and SACCOs do not necessarily help households to cushion against the negative income shocks. This is partly because many of the shocks affect most people in a given locality. Therefore, relying solely on the local mitigating mechanisms may not be a good option. This calls for a need to design policies that would enable households to insure themselves beyond their local insurance mechanisms. Public insurance and social safety nets programs may help households to overcome the negative income shocks.

## Appendix

See Tables 8, 9, 10, 11, 12, 13, 14, 15 and 16.

**Table 8** Components and the average expenditure that parents incur (other than school fee)

	Pre-fee-free policy (2008 and 2012 data combined) ( <i>n</i> = 2992)		Post-fee-free policy (2019/2020 data) ( <i>n</i> = 917)	
	Mean	SD	Mean	SD
School fee	142,839.3	640,865.2	22,549.62	216,589.5
Books and materials	28,875.41	80,128.68	5473.391	21,007.39
Uniforms	30,163.32	40,586.29	9353.762	30,563.54
Transport	16,158.64	103,103.9	4085.06	37,504.31
Extra-tuition fee	18,434.49	69,596.25	2801.636	21,836.82
Other contributions	22,036.8	74,825.06	1902.072	11,120.32
Cost of meals (food)	31,765.46	155,968	4768.375	30,507.67
	<i>(n</i> = 1970)		<i>(n</i> = 519)	
<b>Primary</b>				
School fee	120,163.8	624,686.7	31,260.12	254,357.9
Books and materials	26,035.17	65,960.48	9428.324	26,079.04
Uniforms	31,706.4	41,772.6	16,088.44	37,920.56
Transport	16,357.94	118,471.4	5319.461	44,923.71
Extra-tuition fee	19,043.65	74,703.03	5116.763	29,918.45
Other contributions	20,190.56	66,948.03	3352.023	14,412.05
Cost of meals (food)	27,007.83	137,298.1	7998.459	48,983.19
	<i>(n</i> = 856)		<i>(n</i> = 329)	
<b>O-level</b>				
School fee	178,953.2	677,751	51,240.12	323,166.4
Books and materials	39,071.11	104,619.3	13,528.88	35,850.21
Uniforms	38,911.86	46,846.12	18,943.16	44,331.35
Transport	21,302.16	116,020.8	8756.839	58,315.91
Extra-tuition fee	23,530.14	93,829.84	5559.574	28,535.4
Other contributions	27,507.44	74,884.83	5141.033	21,342.55
Cost of meals (food)	38,087.5	160,346.4	9810.942	41,558.86
	<i>(n</i> = 466)		<i>(n</i> = 255)	
<b>A-level</b>				
School fee	248,109.4	942,782.4	38,737.25	319,090.4
Books and materials	45,290.17	123,863.3	11,667.45	32,292.36
Uniforms	38,909.01	33,593.72	17,761.96	35,692.42
Transport	19,629.18	76,391.91	9545.098	64,204.74
Extra-tuition fee	26,228.54	78,911.1	7353.333	38,178.25
Other contributions	35,329.61	112,933.9	4150.196	16,367.5
Cost of meals (food)	41,941.55	152,660.2	10,229.41	47,287.94

**Table 9** Individual types of shocks by year

	2008		2012	
	Freq.	Percent	Freq.	Percent
Drought or floods	770	7.52	1128	10.50
Crop disease or crop pests	706	6.89	651	6.06
Livestock died or were stolen	672	6.56	574	5.34
Household business failure, non-agriculture	170	1.66	232	2.16
Loss of salaried employment or non-payment	97	0.95	103	0.96
Large fall in sale prices for crops	750	7.32	746	6.95
Large rise in price of food	2183	21.32	2293	21.35
Large rise in agricultural input prices	786	7.68	808	7.52
Severe water shortage	1158	11.31	1039	9.67
Loss of land	97	0.95	126	1.17
Chronic/severe illness or accident of household member	318	3.11	264	2.46
Death of a member of household	455	4.44	400	3.72
Death of other family member	1310	12.79	1389	12.93
Break-up of the household	167	1.63	364	3.39
Jailed	20	0.2	28	0.26
Fire	59	0.58	57	0.53
Hijacking/robbery/burglary/assault	347	3.39	280	2.61
Dwelling damaged, destroyed	36	0.35	26	0.24
Other	140	1.37	232	2.16
Total	10,241	100	10,740	100

**Table 10** Household expenditure on education by wealth status

	Very poor ( <i>n</i> = 844)		Poor ( <i>n</i> = 871)		Moderate ( <i>n</i> = 744)		Rich ( <i>n</i> = 533)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Per school-age child education expenditure	14,640.71	19,193.07	27,683.78	46,652.45	53,338.4	79,602.26	263,418	422,118.6
Share of education expenditure	0.03	0.04	0.03	0.05	0.04	0.07	0.09	0.11



**Table 11** Income shock and educational investment

	(1)	(2)	(3)
	Per school-age educational expenditure (7–13 years)	Per school-age educational expenditure (14–17 years)	Per school-age educational expenditure (18–19 years)
1 if recently experienced income shock	-0.123 (-0.958)	-0.560*** (-3.020)	-0.640* (-1.941)
Shock × poor household <sup>a</sup>	0.149 (1.081)	0.165 (0.711)	-0.760** (-2.049)
Shock × moderate household	0.221 (1.346)	0.256 (1.060)	0.720* (1.908)
Shock × rich household	0.647*** (2.910)	0.835** (2.144)	-0.177 (-0.389)
1 if female-headed household	0.161 (1.648)	-0.364** (-2.279)	0.091 (0.341)
Household head's age	0.008*** (2.787)	0.002 (0.425)	0.012 (1.203)
Household size	-0.201*** (-8.997)	-0.010 (-0.356)	-0.071 (-1.336)
1 if head completed primary school	0.361*** (4.695)	0.218 (1.415)	0.310 (1.060)
Number of school-age children (7–19 years)	0.009*** (5.013)	0.164*** (2.967)	0.276*** (2.822)
Log per capita income	0.040*** (3.212)	-0.023 (-0.836)	-0.035 (-0.679)
1 if over the past 12 months borrowed (other than from self-help groups and SACCOs)	-0.243** (-2.225)	0.449 (1.248)	1.509*** (3.459)
1 if household has a bank account	0.315*** (2.887)	0.276 (1.397)	0.278 (0.845)
Asset index	0.185*** (5.843)	0.184*** (4.499)	0.166 (1.631)
1 if household received remittances	0.105 (1.184)	0.312** (2.027)	0.319 (1.361)

Table 11 (continued)

	(1)	(2)	(3)
	Per school-age educational expenditure (7–13 years)	Per school-age educational expenditure (14–17 years)	Per school-age educational expenditure (18–19 years)
1 if received group assistance (other than from self-help groups and SACCOs)	-0.332*** (-2.999)	0.020 (0.085)	0.349 (0.859)
1 if rural household	-0.270*** (-2.728)	-0.128 (-0.630)	-0.563* (-1.758)
1 if there is government primary school within the community	-0.124 (-1.332)	-0.300 (-1.356)	-0.426 (-1.271)
1 if there is private primary school within the community	0.111 (0.904)	0.582* (1.902)	0.822* (1.842)
1 if there is government secondary school within the community	0.104 (1.272)	0.295** (2.255)	0.184 (0.731)
1 if there is private secondary school within the community	0.181 (1.220)	0.437 (1.630)	-0.979* (-1.961)
Constant	7.928*** (37.226)	7.865*** (8.832)	0.180 (0.095)
Observations	1970	856	466
Number of households	985	428	233
R-squared	0.284	0.270	0.393
Household fixed effects	Yes	Yes	Yes
Year × regional dummies	Yes	Yes	Yes

\*\*\*, \*\*, \*Significant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–13 years). This age group is supposed to be in primary school. In column 2, per school-age educational expenditure covers children between (14–17 years). This age group is supposed to be in lower secondary school. In column 3, per school-age educational expenditure covers all children between (18–19 years). This age group is supposed to be in advanced secondary school. The outcome variables are in log

<sup>a</sup>The base category is shock × very poor household. Robust *t* statistics in parentheses

**Table 12** Effect of different types of income shock on educational investment

	Agricultural-related shocks		Weather-related shocks		Health-related shocks	
	(1)	(2)	(3)	(4)	(5)	(6)
	Per school-age educational expenditure (7–19 years)	Budget share of education	Per school-age educational expenditure (7–19 years)	Budget share of education	Per school-age educational expenditure (7–19 years)	Budget share of education
1 if recently experienced income shock (agricultural-related)	–0.178 (–1.548)	0.004 (1.207)				
Agricultural shock × poor household <sup>a</sup>	0.535*** (3.768)	–0.011** (–2.232)				
Agricultural shock × moderate household	0.497*** (3.193)	–0.008* (–1.680)				
Agricultural shock × rich household	1.053*** (4.681)	0.010 (0.942)				
1 if recently experienced income shock (weather-related)			–0.644*** (–4.321)	0.001 (0.170)		
Weather shock × poor household <sup>b</sup>			0.539*** (2.955)	–0.010* (–1.734)		
Weather shock × moderate household			1.015*** (5.085)	–0.001 (–0.202)		
Weather shock × rich household			1.054*** (3.617)	–0.008 (–0.757)		
1 if recently experienced income shock (health-related)					0.277 (1.432)	–0.002 (–0.446)
Health shock × very poor household <sup>c</sup>					–0.570*** (–3.410)	0.012** (2.303)
Health shock × moderate household					–0.015 (–0.088)	–0.010* (–1.914)
Health shock × rich household					–0.012 (–0.055)	–0.001 (–0.114)
Constant	7.414*** (11.857)	–0.100*** (–5.366)	7.541*** (12.123)	–0.096*** (–4.959)	7.496*** (11.986)	–0.103*** (–5.391)
Observations	2992	2992	2992	2992	2992	2992
R-squared	0.276	0.243	0.276	0.242	0.271	0.244
Number of households	1496	1496	1496	1496	1496	1496
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year × regional dummies	Yes	Yes	Yes	Yes	Yes	Yes

Table 12 (continued)

	Agricultural-related shocks		Weather-related shocks		Health-related shocks	
	(7)	(8)	(9)	(10)	(11)	(12)
	Per school-age educational expenditure (7–17 years)	Budget share of education	Per school-age educational expenditure (7–17 years)	Budget share of education	Per school-age educational expenditure (7–17 years)	Budget share of education
1 if recently experienced income shock (agricultural-related)	−0.209* (−1.820)	0.007** (2.328)				
Agricultural shock × poor household <sup>a</sup>	0.347** (2.496)	−0.014*** (−2.788)				
Agricultural shock × moderate household	0.291* (1.926)	−0.011** (−2.249)				
Agricultural shock × rich household	1.152*** (5.587)	0.007 (0.644)				
1 if recently experienced income shock (weather-related)			−0.595*** (−4.085)	0.002 (0.412)		
Weather shock × poor household <sup>b</sup>			0.458*** (2.671)	−0.013** (−2.065)		
Weather shock × moderate household			0.911*** (4.573)	−0.004 (−0.597)		
Weather shock × rich household			1.409*** (5.240)	−0.018 (−1.488)		
1 if recently experienced income shock (health-related)					0.297** (2.313)	−0.002 (−0.439)
Health shock × very poor household <sup>c</sup>					−0.472*** (−2.834)	0.014*** (2.690)
Health shock × moderate household					−0.006 (−0.033)	−0.009* (−1.661)
Health shock × rich household					0.044 (0.209)	0.005 (0.547)
Constant	8.506*** (14.523)	−0.096*** (−5.199)	8.701*** (15.209)	−0.092*** (−4.819)	8.727*** (14.476)	−0.100*** (−5.291)
Observations	2702	2702	2702	2702	2702	2702
R-squared	0.272	0.242	0.276	0.241	0.284	0.242
Number of households	1351	1351	1351	1351	1351	1351
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year × regional dummies	Yes	Yes	Yes	Yes	Yes	Yes

\*\*\*, \*\*, \*Significant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. Other regressors included, but omitted from the table, are: 1 if female headed household, household head's age, household size, 1 if head completed primary school, number of school-age children (7–19 years), log per capita income, 1 if over the past 12 months borrowed (other than from self-help groups and SACCOs), 1 if household member has a bank account, asset index, 1 if has received any remittances in the last 12 months, 1 if received group assistance (other than from self-help groups and SACCOs), 1 if rural household, 1 if there is government primary school within the village, 1 if there is private primary school within the village, 1 if there is government secondary school within the village, and 1 if there is private secondary school within the village

<sup>a</sup>The base category is agricultural shock × very poor household

<sup>b</sup>The base category is weather shock × very poor household

<sup>c</sup>The base category is health shock × poor household. Robust t statistics in parentheses

**Table 13** Self-help groups and SACCOs in cushioning against income shocks

	(1) Per school-age educational expenditure (7–13 years)	(2) Per school-age edu- cational expendi- ture (14–17 years)	(3) Per school-age educational expenditure (18–19 years)
1 if recently experienced income shock	−0.149 (−1.136)	−0.652*** (−3.378)	−0.660* (−1.967)
1 if member in self-help groups	−0.969** (−2.266)	0.019 (0.029)	−0.827 (−1.101)
1 if member in SACCOs	0.106 (0.665)	−0.274 (−0.801)	0.173 (0.314)
Shock × membership in self-help groups	0.632 (1.340)	−0.698 (−0.993)	0.748 (0.696)
Shock × membership in SACCOs	0.141 (0.589)	1.156** (2.167)	−0.163 (−0.158)
Shock × poor household <sup>a</sup>	0.141 (1.014)	0.175 (0.745)	−0.747** (−1.991)
Shock × moderate household	0.209 (1.271)	0.193 (0.806)	0.748* (1.899)
Shock × rich household	0.632*** (2.868)	0.747** (1.976)	−0.126 (−0.276)
1 if female-headed household	0.165* (1.708)	−0.376** (−2.345)	0.116 (0.422)
Household head's age	0.008*** (2.722)	0.002 (0.287)	0.011 (1.046)
Household size	−0.202*** (−9.015)	−0.012 (−0.404)	−0.070 (−1.267)
1 if head completed primary school	0.358*** (4.601)	0.179 (1.147)	0.307 (1.026)
Number of school-age children (7–19 years)	0.009*** (5.090)	0.162*** (2.911)	0.273*** (2.702)
Log per capita income	0.042*** (3.357)	−0.024 (−0.872)	−0.033 (−0.632)
1 if over the past 12 months borrowed (other than from self-help groups and SACCOs)	−0.272** (−2.393)	0.378 (1.104)	1.483*** (3.348)
1 if household has a bank account	0.319*** (2.954)	0.341* (1.664)	0.247 (0.742)
Asset index	0.183*** (5.663)	0.181*** (4.431)	0.165 (1.622)
Constant	7.957*** (36.917)	8.031*** (9.259)	0.201 (0.106)
Observations	1970	856	466
Number of households	985	428	233
R-squared	0.288	0.279	0.395

**Table 13** (continued)

	(1) Per school-age educational expenditure (7–13 years)	(2) Per school-age educational expenditure (14–17 years)	(3) Per school-age educational expenditure (18–19 years)
Household fixed effects	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>
Year × regional dummies	<i>Yes</i>	<i>Yes</i>	<i>Yes</i>

\*\*\*, \*\*, \*Significant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–13 years). This age group is supposed to be in primary school. In column 2, per school-age educational expenditure covers children between (14–17 years). This age group is supposed to be in lower secondary school. In column 3, per school-age educational expenditure covers all children between (18–19 years). This age group is supposed to be in advanced secondary school. The outcome variables are in log. Other regressors included, but omitted from the table, are; 1 if has received any remittances in the last 12 months, 1 if received group assistance (other than from self-help groups and SACCOs), 1 if rural household, 1 if there is government primary school within the village, 1 if there is private primary school within the village, 1 if there is government secondary school within the village, and 1 if there is private secondary school within the village

<sup>a</sup>The base category is shock × very poor household. Robust *t* statistics in parentheses

**Table 14** How disperse was the shock? Disperse of the shocks

It affected...	2008		2012	
	Freq.	Percent	Freq.	Percent
Only this household	2595	35.11	2491	30.2
Some other households	754	10.2	1087	13.18
Most households in this community	3295	44.58	3588	43.51
All households in this community	747	10.11	1081	13.11
Total	7391	100	8247	100

**Table 15** Income shock and educational expenditure: post-2015

	(1) Per school-age educational expenditure (7–13 years)	(2) Per school-age educational expenditure (14–17 years)	(3) Per school-age educational expenditure (18–19 years)
1 if recently experienced income shock	−0.761** (−2.298)	−0.583** (−2.555)	−0.189 (−0.554)
Shock × poor household <sup>a</sup>	0.767* (1.740)	0.469 (1.036)	0.098 (0.234)
Shock × moderate household	0.627 (1.592)	0.810*** (2.750)	0.211 (0.590)
Shock × rich household	0.412 (1.073)	1.122*** (2.961)	0.124 (0.337)
1 if female-headed household	0.397** (1.980)	0.325 (1.624)	−0.184 (−1.178)
Household head's age	−0.009* (−1.683)	0.001 (0.198)	0.001 (0.177)
Household size	−0.032 (−0.906)	−0.042 (−1.216)	−0.011 (−0.326)

**Table 15** (continued)

	(1)	(2)	(3)
	Per school-age educational expenditure (7–13 years)	Per school-age educational expenditure (14–17 years)	Per school-age educational expenditure (18–19 years)
1 if head completed primary school	0.106 (0.668)	0.116 (0.730)	0.320** (2.126)
Number of school-age children (7–19 years)	0.055 (0.816)	0.090 (1.486)	0.049 (0.855)
Log per capita income	–0.015 (–0.409)	–0.087 (–1.539)	–0.004 (–0.129)
1 if over the past 12 months borrowed (other than from self-help groups and SACCOs)	0.647** (2.334)	0.712** (2.256)	0.041 (0.125)
1 if has a bank account	–0.114 (–0.526)	0.021 (0.094)	–0.012 (–0.056)
Log value of assets	0.274*** (5.130)	0.177*** (3.293)	0.041 (0.706)
1 if received remittances in the last 12 months	0.469*** (2.736)	0.223 (1.263)	0.208 (1.351)
1 if received group assistance (excluding self-help groups and SACCOs)	0.306 (0.909)	0.130 (0.391)	0.114 (0.388)
1 if rural household	0.274* (1.684)	0.033 (0.198)	–0.260* (–1.765)
Constant	4.475*** (6.036)	7.002*** (8.485)	8.308*** (11.163)
Observations	519	329	255
R-squared	0.115	0.108	0.058

\*\*\*, \*\*, \*Significant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–13 years). This age group is supposed to be in primary school. In column 2, per school-age educational expenditure covers children between (14–17 years). This age group is supposed to be in lower secondary school. In column 3, per school-age educational expenditure covers all children between (18–19 years). This age group is supposed to be in advanced secondary school. The outcome variables are in log

<sup>a</sup>The base category is shock × very poor household. Robust *t* statistics in parentheses

**Table 16** Self-help groups and SACCOs in cushioning against income shocks: post-2015

	(1)	(2)	(3)
	Per school-age educational expenditure (7–13 years)	Per school-age educational expenditure (14–17 years)	Per school-age educational expenditure (18–19 years)
1 if recently experienced income shock	–0.739** (–2.374)	–0.348 (–1.459)	–0.303 (–1.036)
1 if member in self-help groups	0.721 (1.186)	1.240** (2.247)	0.783* (1.958)
1 if member in SACCOs	–0.161 (–0.363)	–0.108 (–0.273)	–0.637*** (–2.814)
Shock × membership in self-help groups	0.364 (0.382)	3.605*** (5.345)	–1.096* (–1.964)
Shock × membership in SACCOs	0.035 (0.056)	–0.796* (–1.934)	0.752* (1.812)
Shock × poor household <sup>a</sup>	0.711 (1.623)	0.352 (0.757)	0.197 (0.467)
Shock × moderate household	0.592 (1.526)	0.732** (2.477)	0.282 (0.840)
Shock × rich household	0.401 (1.087)	0.895** (2.563)	0.168 (0.469)



Table 16 (continued)

	(1)	(2)	(3)
	Per school-age educational expenditure (7–13 years)	Per school-age educational expenditure (14–17 years)	Per school-age educational expenditure (18–19 years)
1 if female-headed household	0.378* (1.919)	0.166 (0.906)	–0.157 (–1.011)
Household head's age	–0.008 (–1.512)	0.002 (0.455)	0.000 (0.027)
Household size	–0.030 (–0.859)	–0.033 (–0.922)	–0.016 (–0.464)
1 if head completed primary school	0.111 (0.693)	0.142 (0.880)	0.309** (2.020)
Number of school-age children (7–19 years)	0.056 (0.822)	0.078 (1.269)	0.052 (0.898)
Log per capita income	–0.018 (–0.495)	–0.095* (–1.655)	0.005 (0.152)
1 if over the past 12 months borrowed (other than from self-help groups and SACCOs)	0.693** (2.486)	0.779** (2.466)	0.140 (0.418)
1 if has a bank account	–0.120 (–0.538)	0.085 (0.362)	0.026 (0.127)
Log value of assets	0.268*** (5.026)	0.159*** (3.164)	0.048 (0.833)
1 if received remittances in the last 12 months	0.410** (2.354)	0.163 (0.966)	0.190 (1.216)
1 if received group assistance (excluding self-help groups and SACCOs)	0.309 (0.929)	0.023 (0.079)	0.092 (0.321)
1 if rural household	0.274* (1.685)	0.033 (0.201)	–0.254* (–1.726)
Constant	4.533*** (6.176)	7.193*** (9.093)	8.204*** (10.973)
Observations	519	329	255
R-squared	0.124	0.174	0.077

\*\*\*, \*\*, \*Significant at 1%, 5%, and 10%, respectively. Robust standard errors are clustered at community-level. In column 1, per school-age educational expenditure covers all children between (7–13 years). This age group is supposed to be in primary school. In column 2, per school-age educational expenditure covers children between (14–17 years). This age group is supposed to be in lower secondary school. In column 3, per school-age educational expenditure covers all children between (18–19 years). This age group is supposed to be in advanced secondary school. The outcome variables are in log

<sup>a</sup>The base category is shock × very poor household. Robust *t* statistics in parentheses

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