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ABSTRACT

Do Different Types of Assets Have Differential Effects on Child Education? Evidence from Tanzania[1]

This analysis is motivated by recognition that anti-poverty interventions often affect both the level and composition of assets held by beneficiaries. To assess the conventional view that assets uniformly improve childhood development through wealth effects, we use three waves of panel data from Tanzania and test whether different types of assets have differential effects on children's educational outcomes. Our results indicate that household durables and housing quality have positive effects, but agricultural assets have adverse effects on children's highest grade completed and exam performances. We use a Hausman-Taylor instrumental variable (HTIV) panel data estimator to identify the effects of both time-varying and time-invariant endogenous variables. We find that the negative effect of agricultural assets is driven by large agricultural equipment and livestock ownership and the negative effect is more pronounced among rural children, poor children, and children from farming households, presumably due to the higher opportunity cost of schooling.

JEL Classification: I25, J22, D13, O12

Keywords: LSMS-ISA, Tanzania, asset ownership, child education, highest grade completed, school performance

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[1] This paper is based on analysis of three waves of the Tanzania National Panel Survey conducted by the Tanzania National Bureau of Statistics in collaboration with the World Bank Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) Project. Funding for collecting and disseminating the data has been very generously provided by the European Union and the Bill and Melinda Gates Foundation. The authors are thankful to Anne Grant, Kathy Baylis, Ben Crost, Craig Gundersen, Hope Michelson, Lokendra Phadera, and Mani Rouhi Rad for helpful comments. The authors are also thankful to the participants in the 2015 Agricultural and Applied Economics Association (AAEA) annual meeting, San Francisco, USA; the 2016 Association of African Agricultural Economists (AAAE) conference, Addis Ababa, Ethiopia; and the 2017 Center for Studies of African Economies (CSAE) Conference, Oxford, UK. The findings, interpretations, and conclusions are those of the authors and should not be attributed to their institutions and affiliations.

1. Introduction

While poverty is typically defined by whether someone has sufficient daily income or consumption to meet basic needs, wealth creation through asset ownership is generally viewed as the principal pathway out of poverty. For example, an asset transfer program targeted to poor households is at the core of poverty-reduction programs run by BRAC, the largest nongovernmental development agency in the world. Banerjee et al. (2015) present evidence from randomized controlled trials from several countries that shows asset transfer programs similar to the BRAC programs had significant and long-lasting effects on poverty reduction.[2] These programs raise the stock of assets in a household and also tend to shift the composition of those assets directly, by delivering a specific asset such as an animal, or indirectly by promoting a specific type of activity.

Owning more assets increases household wealth, and greater wealth can improve well-being in many different ways. One path is through increased investment in human capital, which can break cycles of poverty. A large body of evidence has established that having more physical assets results in greater investment in children's education, particularly in richer countries (Chowa et al., 2013; Conley, 2001; Deng et al., 2014; Elliott et al., 2011; Elliott and Sherraden, 2013; Huang, 2011, 2013; Kim and Sherraden, 2011; Loke, 2013; Shanks, 2007; Zhan and Sherraden, 2003).[3] There is also a fairly extensive body of research on the 'asset-child education' relationship in developing countries. Deng et al. (2014) and Filmer and Pritchett (2001) construct a measure of wealth based on assets and examine child education outcomes; others, like Chowa et al. (2013) and Cockburn and Dostie (2007), construct measures of asset ownership and examine educational outcomes. Chowa et al. (2013) find that Ghanaian children in households that own at least one of five assets – TV, refrigerator, electric iron,

[2] Their experiment had six elements, including asset transfer, training, and short-run support, but they consider the asset transfer to be the core component of the program. They found that the positive effects continued three years after receipt of the asset transfer, and the positive effects are seen in all six countries where the experiment was carried out (Ethiopia, Ghana, Honduras, India, Pakistan, and Peru).
[3] For a survey of the literature, see Elliott et al. (2011).

electric or gas stove, and kerosene – outperformed the control group in English test scores. Similarly, Filmer and Pritchett find a rich-poor gap of more than 30 percent for school enrollment rates in India based on their asset-based wealth indicator.

A common aspect of the studies establishing a positive link between owning more assets and better child educational outcomes is the implicit assumption that the type of asset does not affect this relationship. Most studies either monetize or count asset holdings, converting all assets into a singular wealth scalar, and find a positive relationship between wealth and child education. The main question we explore in this analysis is whether an undifferentiated view of assets ignores the potential for different types of assets to have varying effects on child education. More specifically, we explore 1) whether some types of productive assets (such as livestock, land holding etc.) discourage education investment, possibly by increasing the returns to child labor, while other assets (such as electricity, bicycle, or good quality housing) could contribute to child education by heightening the returns to schooling or raising the efficiency of time spent studying, and 2) whether different types of agricultural assets have differential effects on child educational outcomes.

If different classes of assets have differential effects on educational outcomes, there may be significant scope to improve the design of asset transfer and public investment programs. Such programs usually transfer income-generating assets, such as livestock (Jodlowski et al., 2016; Kafle et al., 2016; Rawlins et al., 2014); agricultural inputs (Denning et al., 2009); and other in-kind physical assets (Banerjee et al., 2015; Muralidharan and Prakash, 2013). Although physical asset transfers may provide a practical approach for programs to improve livelihoods, some assets could influence the returns to child labor in ways that discourage investment in formal education and thus hurt longer-term economic development or at least the prospects of a specific cohort of children.

We contribute to the literature by providing evidence that different types of assets have differential effects on child education. Specifically, we show that household durables and housing

quality indicators have the expected positive effects but agricultural assets affect child education negatively. We also demonstrate that the negative effect of agricultural assets is driven by large agricultural equipment and livestock but land holding size and small agricultural tools have no significant influence on child educational outcomes. In addition, we show that the negative effect of agricultural assets is more pronounced among, girls, rural children, poor children and children of crop producers, which we argue stems from the higher opportunity cost of their schooling. We also find that home ownership, increased access to public schools, access to electricity, improved access to safe drinking water, and improved housing quality can neutralize the negative effects of agricultural assets, implying that, despite discouraging child education initially, the income generated through productive assets could fund eventually public and private investments to support education.

In what follows, section 2 sets out our conceptual framework. In section 3, we describe our data – three waves of the Tanzania National Panel Survey (NPS)[4] -- and empirical model. In section 4, we discuss both the descriptive and the empirical results. Section 5 discusses the policy implications and conclusions.

2. Conceptual framework

A large body of existing literature has examined the effects of specific assets (such as land) on child education but existing studies do not distinguish wealth effects from substitution effects. In addition, these studies have typically demonstrated the 'asset – child education' relationship by using the relationship between child labor and schooling; and for example, showing that an increase in farm size increases child labor and therefore decreases child schooling. The negative association between child labor and land holding emerges mostly from market imperfections. It has been shown

[4] The Tanzania NPS is part of the LSMS-ISA program which aims to marry complex consumption-based household surveys with plot-crop detailed agricultural surveys. The Tanzania NPS data, along with details on the sample and instrument design, are publicly available in the LSMS webpage http://go.worldbank.org/OOLZL0UIR0.

that imperfect land or labor market conditions are the main cause for child labor in agriculture and other household enterprises (Basu, Das, and Dutta, 2010; Bhalotra and Heady, 2003; Dumas, 2007; Cockburn and Dostie, 2007).

Another strand of literature which considers imperfect credit markets as a driver for poor child schooling also uses child labor as a mediation through which access to credit (or lack of it) affects child education (Ranjan, 2001). Beegle, Dehejia, and Gatti (2009); Maldonado and González-Vega (2008) show that an increase in access to credit decreases child labor through positive income effects. Conversely, imperfections in labor and credit markets, reduces access to outside labor and increases child labor (Wydick, 1999), especially in the season of peak labor demand (Hazarika and Sarangi, 2008), and among farming households that are otherwise credit constrained (Maldonado and González-Vega, 2008). Overall, these studies have concluded that if land, labor, or credit markets are imperfect, increase in productive asset holding (such as land) or provision of micro-credit increases child labor and decreases child schooling in agrarian settings.

That child labor adversely affects child education is a common finding (Basu et al., 2010; Haile and Haile, 2012). In addition, a finding that an increase in productive assets holding or provision of micro-credit can decrease child educational outcomes through increased child labor demand is also demonstrated in the literature. However, there has been little considerations of whether different types of assets might have differential effects on child educational outcomes. In this analysis, we provide an intuitive and empirically testable conceptual framework to demonstrate how different types of assets can have differential effects on child educational outcomes. We explicitly allow for multiple pathways for different types of assets to have differential effects on child education, in addition to widely recognized wealth and substitution effects.

Table 1 presents the classes of assets used, specific assets in each group, pathways through which these assets can affect child education, and the existing evidence to support any hypothesis

regarding impacts on education. While considering all assets as wealth is a commonplace, productive assets incur labor to be operational and can increase child labor demand, especially in agrarian settings where both labor and credit markets are imperfect. On the other hand, non-productive assets such as housing quality and household durables represent household wellbeing and may be part of household's consumption decisions, but may not affect child labor. Although productive assets such as agricultural tools, livestock, and land holding size can have adverse effects on child education through increased child labor demand, the net effects depends on the size of positive income effects and negative substitution effects. Non-productive assets, however, likely have positive effects on child educational outcomes because such assets are labor neutral or labor saving and reduce parental stress through enhanced wellbeing.

3. Method and Data

The initial focus of our empirical analysis is to unpack the differential effects of different assets on child education. Our empirical findings are consistent with the prediction from the conceptual framework in that household income always has a positive effect on children's educational outcomes and the effect of assets depends on the type of assets. Since our outcome variables are closely tied with the Tanzanian education system, before we present the data, we provide a brief overview of the educational system. This analysis assesses children's educational outcomes in the context of progression through the Tanzanian school system, represented in Figure 1.

Table 1. Conceptual framework for differential effects of different types of assets and existing evidence

Types of assets	Specific assets	Mechanism	Expected effects on educational outcomes	Evidence
Agricultural assets	Land holding size, number of animals, and number of agricultural tools and equipment such as hoe, spade, plough, tractor etc.	Increase in agricultural assets increase both child labor demand and household income	The net effect is ambiguous because income effect is positive but the increase in child labor has a negative effects on child educational outcomes	Basu et al. (2010), Bhalotra and Heady (2003), Cockburn and Dostie (2007)
Household durables	Information assets such as TV, radio, cell phones	Increase in/access to information assets enhances learning	Positive because enhanced learning through information assets improves educational outcomes	Chowa et al. (2013)
	Transportation assets such as bicycle, motorbike, car	Increase in/access to transportation assets reduces time spent to/from school	Positive because more time is available for study and school is accessible more easily	
	Other durable assets such as furniture, kitchen appliances	Increase in/ownership of durable assets reduces parental stress	Positive because reduced parental stress improves child care and enhances child education	
Housing characteristics	Home ownership and good quality housing	Home ownership reduces stress as well as provides security Home ownership and good housing represents wealth	Positive because reduced stress and increased security among parents and children improves child education. Also positive wealth effects	Zhan and Sherraden (2003), Kim and Sherraden (2011)
	Improved sanitation and safe drinking water	Access to improved sanitation and safe drinking water improves child health	Positive because improved child health enhances learning	
	Distance to source of water	A far source of water may increase child labor demand	Negative because increased child labor for water hauling reduces time available for school/study	Cockburn and Dostie (2007)

Tanzania follows a 2-7-4-2-3+ model of education that starts with 2 years of preprimary school followed by 7 years of primary school, which ends with a national examination, the primary school leaving exam (PSLE), at the end of the 7th grade (MoEVT, 2014). A pass score on the PSLE is required to proceed to government secondary school. Those who fail can either retake the exam or enroll in private secondary school. The first tier of secondary school ends after 11th grade with another national examination, the Form IV exam (the FIVE), or the O+ exam. Students passing the FIVE can move up to the second tier of secondary school; those who fail can either retake the exam or enroll in vocational courses (MS+). The second tier of secondary school ends after grade 13 with yet another national examination, the Form VI exam (the A+ exam). Students passing the A+ exam can go directly to university, another 3+ years of formal education; those who fail must pass a diploma course before they can attend university. Secondary school through the A+ exam in Tanzania is equivalent to high school in the United States.

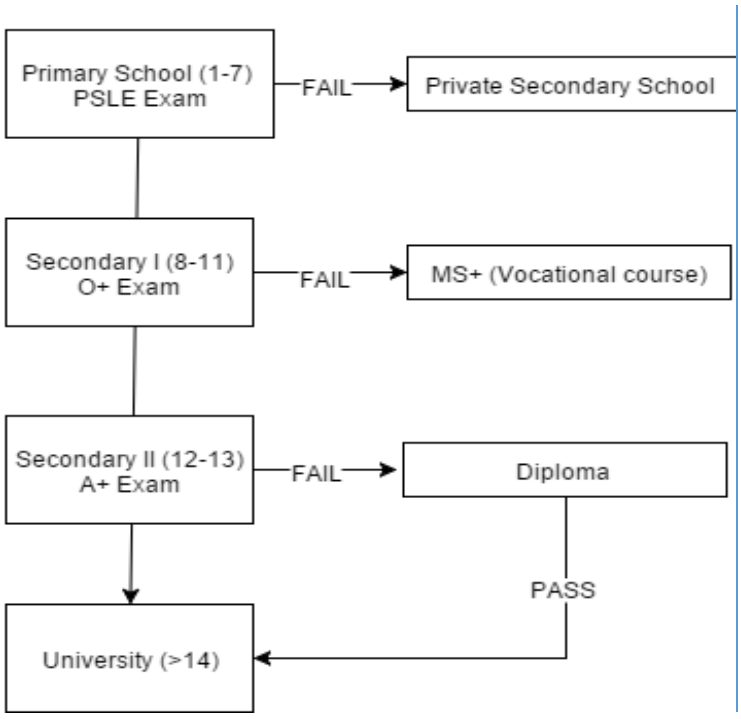

Figure 1. Educational system in Tanzania

3.1. Outcome variables

Based on the school system, outcome variables for this analysis were chosen to estimate the effects of assets on both school enrollment and performance. The variables are: highest grade completed, the number of children ages 10 to 20 who have passed the PSLE exam; and the number of adolescents ages 14 to 24 who have passed the FIVE exam. The highest grade completed is a count variable ranging from 1 to 25. Twenty-five indicates an advanced university degree (e.g., a PhD in the United States). For the highest grade completed, the analysis covers only individuals aged 6-18 in the first round. Individuals who have never attended school are also included in the analysis and their highest grade completed is recorded as 0.

While the highest grade completed is measured for individuals, the PSLE and FIVE variables are aggregated to the household level because there is little to no variation in individual outcomes over time. The test scores are binary variables, pass or fail, and individuals who pass the exam once never retake the same exam. In our sample, about 65 percent of students pass the PSLE in the first attempt and the retake rate is very low; only about 13 percent of students unsuccessful in the first attempt succeed in the second. We have a little variation to work with because 95 percent of children have either 1 or 0 throughout and only 5 percent see their scores change over time from 0 to 1. The pattern for FIVE scores is similar. Aggregating the individual-level test performance into a household-level variable results in variation that allows us to distinguish among households where children pass exams with varying rates of success. Using the number of children in the household who have passed the exams allows us to examine test performance, but prevents direct inference about individual performance in the PSLE and FIVE tests.

3.2. Asset variables

Assets are broadly defined here as household durables, housing quality characteristics, and agricultural assets. The three categories are derived from a total of 45 asset variables (Appendix Table

A1). There are 17 household durables (tools and equipment used in the household) such as televisions, radios, cellphones, and bicycles etc. There are 12 housing quality characteristics, such as the quality of floor, roof, and wall materials; number of rooms; and access to electricity, safe drinking water, distance to the closest source of water, and toilet facilities. There are 16 agricultural assets. Among the agricultural assets are farm tools and equipment, livestock, and livestock-related assets.

Because the list of assets is particularly extensive for each category and *a priori* we have no model of which combination of assets matter, we use principal component analysis (PCA) to assign weights to each asset based on their relative contribution to total variance (for each category). Following Filmer and Pritchett (2001), we interpret the first principal component as a proxy for socioeconomic status in part because it captures the largest variation in assets (see also 2001; Filmer and Scott, 2008; McKenzie, 2005; Vyas and Kumaranayake, 2006). Since this analysis uses longitudinal data, we need PCA weights for each wave. It would be possible to use period-specific weighting factors, but allowing weights to change over time produces asset indexes that are not comparable. To address this issue, we pool the waves to produce weighting factors for each asset that are constant over time; as has been done in related literature on using PCA with panel data (see for examples Harttgen et al., 2013; Booysen et al., 2008; Sahn and Stifel, 2003). Appendix Table A1 shows the weighting factors for each asset.

Other variables included in the analysis as controls include individuals' age, sex, and number of siblings; household heads' age, and marital status; household head's gender; and consumption expenditure per adult-equivalent. Other controls are maximum parent's education, binary indicators for school in local community, rural vs urban residence, and economic shock in the last 12 months.

3.3. Data

We use the data from the National Panel Survey (NPS) of Tanzania. The NPS is a nationally 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 (LSMS-ISA). It tracks 3,265 baseline households and all of the split-offs of these households over time. Over the three waves, the attrition rate of households is 4.8 percent. Despite attrition, the sample size increases over time because the survey is designed to track split-off households and members over time. In the second wave of data collection, the number of panel households increases to 3,924; and in the third wave, to 5,010 households. The NPS follows the same households and all household members age 15 or older (excluding live-in servants). The number of observations for individuals went up from 16,709 in the baseline to 20,599 in the second wave and 25,412 in the third. The attrition rate for individuals was 7.5 percent.

We use an unbalanced panel from the three survey rounds. The full panel consists of 3,082 households and 16,114 individuals in the first wave, 3,825 households and 15,331 individuals in the second wave, and 4,528 households and 14,767 individuals in the third wave. The sample size for this analysis varies with the outcome variable. For the highest grade completed, the panel consists 5,637 children of ages 6 to 18 from 2,213 households in wave 1, 5,316 children from 2,368 households in wave 2, and 5,164 children from 2,597 households in wave 3. Similarly, our panel for the PSLE variable consists 2,660 households with at least one PSLE-eligible child (ages 10 to 20) in wave 2 and 3,131 households with at least one PSLE eligible child in wave 3. Our panel for the FIVE variable consists 2,741 households with at least one FIVE eligible child (ages 14 to 24) in wave 2 and 3,286 households in wave 3.

3.4. Econometric model

Our empirical approach assumes labor markets are incomplete and that household decisions are non-separable. As outlined in the conceptual framework, children's educational performance (q) is determined by time spent studying or school hours, non-agricultural assets (A), and other factors (θ). Assume that among the other factors are parental characteristics, household income (I), and child's

individual ability (C_u); and that school hours depend on agricultural assets (*K*) and household income. Parental characteristics consist of observed features, such as education (P_e), and unobserved variables, such as ability (P_u). Conceptually, child education is a function of parental characteristics, child ability, assets, and income, that is $q = f(P_e, P_u, C_u, A, K, I)$. We know that parental education is a function of parental ability, assets, and income, that is $P_e = f(P_u, A, K, I)$. Also, children's unobserved ability is a function of parental unobserved ability, $C_u = g(P_u)$. This implies that children's ability (C_u) is correlated with all parental education, assets, and income, i.e., $corr(C_u, P_e) \neq 0$, $corr(C_u, A) \neq 0$, and $corr(C_u, I) \neq 0$.

That observed variables (parental education, assets, and income) and unobserved variables (children's and parent's abilities) are correlated and both affect children's educational outcomes raises the problem of endogeneity that has not been addressed in the existing literature (Elliott et al., 2011; Lerman and McKernan, 2013). Assuming that the unobserved child ability is time-invariant, we use panel data to address the endogeneity problem empirically. We estimate the following model with a panel estimator:

$$q_{it} = x_{1it}\alpha + x_{2it}\beta + z_{1i}\theta + z_{2i}\gamma + u_i + \varepsilon_{it} \quad (1)$$

where *i* indicates individual and *t* indicates time. Thus, q_{it} is child *i*'s educational outcome at time *t*; x_{1it} is a vector of time-varying exogenous variables, namely individual's age, number of siblings, age, sex, and marital status of the household head, indicators for school in the village, rural residence, and shock in the last 12 months; x_{2it} is a vector of time-varying endogenous variables, namely agricultural asset index (K), non-agricultural asset indexes (A), consumption expenditure (I), and household size; z_{1i} is a vector of time-invariant exogenous variables, namely individual's gender; z_{2i} is

a vector of time-invariant endogenous variables, namely parental education (P_e); u_i is a time-invariant individual effect that includes factors such as unobserved child ability, (C_u), that are likely to be correlated with asset ownership, income, and parental education; and ε_{it} is an idiosyncratic error term. Equation (1) provides the structure required for an instrumental variable estimator proposed by Hausman and Taylor (1981) and widely known as Hausman-Taylor Instrumental Variable estimator (hereafter referred to as HTIV). Table A2 in the appendix provides a list of variables used in the Hausman-Taylor framework.

The HTIV model relies on instruments that come from within the model: z_{1i} serves as an instrument for itself; the within transformations $x_{1it} - \bar{x}_{1i}$ and $x_{2it} - \bar{x}_{2i}$ serve as valid instruments for x_{1it} and x_{2it}, respectively; and the between transformation $\bar{x}_{1i}$ serves as a valid instrument for z_{2i}. Therefore there must be at least as many time-varying exogenous variables (x_{1it}) as time-invariant endogenous variables (z_{2i}). In addition, conditions (i) and (ii) are both necessary and sufficient conditions for the HTIV estimator to produce unbiased estimates:

i.) $E(u_i|x_{2it}) \neq 0, E(u_i|z_{2i}) \neq 0$

ii.) $E(u_i|x_{1it}) = 0, E(u_i|z_{1i}) = 0$ and $E(\varepsilon_{it}|x_{1it}, x_{2it}, z_{1i}, z_{2i}) = 0$

Condition (i) indicates that individual traits that are unobserved to researchers affect both child educational outcomes and household asset holdings, per-capita consumption, household size, and parental education. This assumption is likely to hold because assets, consumption, parental education, and household size are expected to affect child educational outcomes both directly and indirectly through unobserved individual traits. Also, children's unobserved individual traits are highly correlated with parental unobserved traits. Condition (ii) indicates that, unlike asset holding,

consumption, and household size, other demographic variables (such as age, sex, marital status, number of school age children, school in village, rural dummy, and shock indicator) are not dependent on individual unobserved factors. This assumption is also very likely to hold because the aforementioned demographic variables affect child educational outcomes only directly, less likely through individual unobserved abilities.

Estimating equation (1) with the random effects model yields inconsistent estimates because the 'zero correlation' assumption is clearly violated. The fixed effects model and the HTIV method[5] both yield consistent estimates, but the HTIV approach is more efficient and can also estimate coefficient estimates on time-constant variables (Baltagi et al., 2003; Hausman and Taylor, 1981). Our preferred method is HTIV because of efficiency gains it provides and because time-constant variables like parent's education and gender are of interest. Even though our preferred estimator is HTIV, for comparison purposes, we provide results from all random effects, fixed effects, and HTIV estimators. We also assess the suitability of the fixed effects and random effects model using Hausman specification test. In every model specification we run in this analysis, the null hypothesis is always rejected in favor of the fixed effects with the chi-squared statistics of at least 40. Since the fixed effects estimator is also a consistent estimator, results from fixed effects model are used in inferences.

4. Results

4.1. Summary statistics

Tables 2–4 present summary statistics. All point estimates are weighted to allow inferences to the population of either individuals or households, depending on the variable. Table 2 presents

[5] In practice, HTIV can be estimated using the STATA in-built command '*xthtaylor*'. We use the *xthtaylor* command, specifying asset indexes, parental education, consumption, and household size as endogenous variables. Conceptually, first equation (1) is estimated with the fixed effects model saving the residual. The residual is used to run a regression on z_{1i} and z_{2i} by using x_{1it} and z_{1i} as instruments. All variables in the model are then transformed by using the estimated variance from the residual regression. The transformed model is estimated by using $x_{1it} - \bar{x}_{1i}, x_{2it} - \bar{x}_{2i}, z_{1i}$ and $\bar{x}_{1i}$ as instruments.

demographic characteristics of the sample in all three waves, disaggregated by individual characteristics, household characteristics, and characteristics of the household head. The first panel in Table 2 presents individual level variables; age, sex, age started school, and maximum parent's education. Tanzania has a very young population: in the NPS the average age is 21 years in the baseline, 23 in the second wave, and about 25 in the third wave. For those who have attended school, the average age at start of school is 8, which is higher than the sub-Saharan Africa average of 7 years. Parental characteristics are important for the analysis because the effect of assets on child education mostly operates through parental decisions about child labor, schooling, and intra-household resource allocation. Parental education is measured by 'maximum parent's education', the maximum education of father and mother. Since the vast majority of parents in the sample are not current students, we keep parental education constant across waves. On average, at least one parent has attended primary school, but has not completed it.

The second panel in Table 2 presents household level variables; consumption expenditure, household size, number of children ages 6 to 18, binary indicator for shocks, rural residence, and school in village. In all three waves, average household size is about 5, and about half of the individuals are children aged 6-18 years. Apart from individual and household head characteristics, the effects of assets may differ by income level, rural or urban location, household response to transitory shocks, and access to a school in the local community. Apparently, even though more than 70 percent of households in the sample are rural, a strikingly large proportion of households (90 percent) have a primary or secondary school in the village. Although more than 50% households reported to have experienced shocks in the last 12 months, there is still a decrease in the poverty rate over the course of panel. Consistent with the reduction in national poverty rates from 37.4% in 2007 to 28.2% in 2012 (World Bank, 2015), average annual consumption per adult-equivalent in our sample increased from

T Sh0.71 million in 2008 to T Sh1.15 million in 2012. The consumption growth corresponds to a decrease in poverty rate from 45.7% in 2008 to 24.3% in 2012.

Table 2. Summary statistics of individual and household characteristics

Characteristics	**Wave 1**	**Wave 2**	**Wave 3**
Individual	**(2008/09)**	**(2010/11)**	**(2012/13)**
Age	20.91	22.92	24.61
	(0.149)	(0.151)	(0.149)
Gender (1=Male, 0=Female)	0.49	0.49	0.49
	(0.004)	(0.004)	(0.004)
Age started school†	8.01	8.01	8.01
	(0.021)	(0.021)	(0.021)
Maximum parent's education‡	2.61	2.59	2.58
	(0.010)	(0.010)	(0.010)
Observations	16,114	15,331	14,767
Household			
Expenditure, per adult-equivalent	0.71	0.81	1.15
(million TSZ)	(0.012)	(0.013)	(0.017)
Household size	4.99	5.12	4.93
	(0.049)	(0.047)	(0.042)
Number of children 6-18	2.80	2.77	2.59
	(0.039)	(0.036)	(0.032)
Shock in the last 12 months	0.53	0.42	0.37
(1=Yes)			
	(0.009)	(0.008)	(0.007)
Rural (1=Rural, 0=Urban)	0.72	0.70	0.69
	(0.008)	(0.008)	(0.007)
School in village (1=Yes, 0=No)	0.89	0.94	0.96
	(0.006)	(0.004)	(0.003)
Household Head			
Age	44.7	45.5	45.5
	(0.28)	(0.26)	(0.24)
Gender (1=Male, 0=Female)	0.75	0.75	0.74
	(0.008)	(0.007)	(0.007)
Education level (grade)	2.27	2.33	2.40
	(0.023)	(0.021)	(0.019)
Marital status (1= Married, 0 else)	0.75	0.72	0.70
	(0.008)	(0.007)	(0.007)
Observations	3082	3825	4528

Notes: Point estimates are population weighted means. Standard errors are in parentheses.
†Number of observations for 'age started school' is 10,536 only because about 35 percent of the population has never attended school
‡Maximum parent's education is maximum education level of father or mother. It is coded as follows: 1= no education, 2= primary not finished, 3= primary, 4= secondary not finished, 5= secondary, and 6= higher than secondary.
Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

The third panel in Table 2 presents household head's characteristics; age, gender, marital status, and education of the household head. On average, household heads are relatively young, averaging 45 years across waves; the average household head's age stays flat across waves because we use an unbalanced panel and the follow-up sample includes split-off households with younger heads. In each wave, more than 70 percent of household heads are married, but the gender balance of headship is highly skewed to males, with only about 25 percent of households headed by females.

Table 3 summarizes children's educational outcomes. We track the cohort of children aged 6-18 at baseline to estimate the effects of assets on 'highest grade completed'. On average, children in the sample had completed 5th grade at baseline, 6th grade in the second wave, and 8th grade in the third. Since we use unbalanced panel of children who are 6 to 18 in the first wave and available in at least one of the follow-up surveys, the number of observations varies across waves.

Table 3. Summary statistics of child educational outcomes across three waves

Survey wave	Educational Outcomes		
	Highest grade completed	Number of PSLE pass children ‡	Number of FIVE pass children‡
Wave 1 (2008/09)	5.29 (0.047) [5637]	-	-
Wave 2 (2010/11)	6.77 (0.054) [5316]	0.49 (0.015) [2660]	0.51 (0.016) [2741]
Wave 3 (2012/13)	8.08 (0.056) [5164]	0.50 (0.014) [3131]	0.50 (0.014) [3286]

Notes: Point estimates are weighted means, population weighted for individual level outcome (highest grade completed) and household weighted for other outcomes. Standard errors are in the parentheses and number of observations are in the brackets.
‡Primary school leaving exam (PSLE) and Form IV exam (FIVE) are national level examinations administered after 7th and 11th grades, respectively. Both PSLE and FIVE outcomes are presented for the second and third waves only because test scores data are not available for the first wave.
Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

As PSLE and FIVE data are not available for the first wave, educational outcomes related to the PSLE and FIVE tests are examined in the second and third waves only. Even though the passing rate for both tests is higher than 65 percent in both waves, only a small proportion of eligible children passed these tests because many school-age children were not enrolled in school. As a consequence, the number of school-age children who have passed the PSLE test is about 0.5 per household across both waves. The statistic is similar for the FIVE test.

Table 4 presents descriptive statistics for the asset indexes and specific assets for all three waves. Since we calculate asset indexes at the household level, we assume that all children within a household have equal access to household assets. Mirroring the increase in consumption per adult, aggregate asset index also increases over time, albeit the values are still negative. The average value of the agricultural-asset index decreases over time, 0.057 in 2008 to 0.02 in 2012. However, the values are not statistically significantly different. Among the four groups of agricultural assets, land holding size increases from 3.9 acres per household in 2008 to 4.04 acres in 2012, and livestock ownership also increases from 1.7 livestock units in baseline to 2.2 livestock units in the third wave. In contrast, the count of both small and large agricultural tools remains about the same over time. Both the index for household durables and the housing quality index increase over the span of the three waves. Specifically, information and transportation assets increase over time but the number of other household durables decreases over the course of panel. Housing quality index also increases over time and the increase comes from increase in good quality housing, access to safe drinking water, and access to electricity.

Table 4. Summary statistics of asset variables across three waves

Asset variables	Wave 1 (2008/09)	Wave 2 (2010/11)	Wave 3 (2012/13)
Aggregated asset index†	-0.63	-0.46	-0.31
	(0.047)	(0.042)	(0.038)
Agricultural assets			
Agricultural asset index	0.057	0.010	-0.022
	(0.044)	(0.022)	(0.011)
Land holding size (Acres)	3.91	4.00	4.04
	(0.11)	(0.11)	(0.10)
Tropical livestock unit (TLU)	1.68	1.94	2.22
	(0.13)	(0.12)	(0.16)
Number of small agricultural tools	2.42	2.53	2.43
	(0.039)	(0.036)	(0.034)
Number of large agricultural tools	0.10	0.084	0.091
	(0.010)	(0.006)	(0.005)
Durable assets			
Household durable index	-0.37	-0.23	-0.24
	(0.036)	(0.031)	(0.027)
Number of information assets	1.72	2.00	2.17
	(0.062)	(0.032)	(0.030)
Number of transportation assets	0.55	0.61	0.57
	(0.017)	(0.015)	(0.013)
Other durable assets	1.04	1.00	0.98
	(0.044)	(0.035)	(0.030)
Housing characteristics			
Housing quality index	-0.54	-0.38	-0.15
	(0.036)	(0.033)	(0.031)
Home ownership	0.80	0.75	0.72
	(0.007)	(0.007)	(0.007)
Good quality housing	0.33	0.34	0.39
	(0.009)	(0.008)	(0.007)
Safe drinking water	0.61	0.62	0.62
	(0.009)	(0.008)	(0.007)
Distance to nearest source of water	22.9	15.4	16.1
	(0.53)	(0.37)	(0.34)
Access to electricity	0.15	0.18	0.23
	(0.007)	(0.006)	(0.006)
Observations	3082	3825	4528

Notes: Point estimates are population weighted means. Standard errors are in the parentheses. All asset indexes are constructed using the Principal Component Analysis (PCA) and the same loading factors obtained from the pooled data are used across three waves.
†The aggregated asset index consists of 45 variables, and three sub-indexes – agricultural asset index, household durable index, and housing quality index – consist 17, 16, and 12 variables, respectively.
Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

4.2. Empirical results

We first examine the data to explore the relationship between different asset types and child labor. Pooling the data from the three waves, we estimate a probit regression of child labor on all three types of assets for various subsamples. We find that agricultural assets increase the likelihood of child labor among crop producers and rural households in general, but children are less likely to engage in any labor-generating activity if the family owns more household durables or experiences an improvement in housing quality (Appendix Table A3). Specifically, one unit increase in agricultural asset index increases the likelihood of child labor by 1.8% in rural areas, and by 1.4% among grain crop farmers. But, one unit increase in housing quality index is associated with about 16% decrease in the likelihood of child labor. This finding supports our assumption that effects of agricultural assets on child education operate through child labor. Next, we estimate the effect of asset-holding on children's educational outcomes.

4.2.1. Effects of assets on highest grade completed

We estimate the effects of assets on highest grade completed using equation (1) for three different model specifications with three different panel estimators: random effects, fixed effects, and HTIV. All three specifications are the same except for the treatment of asset variables. The first specification in Table 5 does not allow for analysis of differential effects of different assets types, but the second specification covers three disaggregated asset indexes (Table 6). The third specification includes further disaggregation of agricultural assets, household durables, and housing quality as presented in Table 4. Results in Table 8 come from the second specification, estimated with our preferred HTIV model for various subsamples. In all regressions, standard errors are clustered at the individual level. Tables are structured so that results in the first column are obtained from the random effects estimator, which is inconsistent under conditions (i) and (ii) shown in section 3.4. Under the

same conditions, results in the second and third columns are consistent; results in the third column are based on our preferred HTIV estimator.

Table 5 shows how the aggregated asset index affects highest grade completed. The aggregated index has the expected sign, suggesting positive wealth effects on children's education. Specifically, one unit increase in aggregate asset index increases children's highest grade completed by 0.045 grade and, all else constant, it would require a rather unrealistic 22 point increase in asset index to increase the highest graded completed by one grade level. The positive coefficient on consumption expenditure also suggests positive income effects; a 10% increase in consumption expenditure increases the highest grade completed by one grade level.

Among other controls, both having educated parents and access to a school in the village help children reach higher grades. A one grade level increase in parental education increases the children's completed grade by 1.4 grades. For better comparisons, the effects of a 15 percent increase in consumption expenditure and one level increase in parental education (such as primary to secondary school) are identical. Educated parents may expect a larger return from sending children to school, so they may not consider the opportunity cost of schooling for their children to be high. Similarly, children who live near a school may both attend school and occasionally take part in farm-household activities. This would lead to the positive effect for 'school in village' even if the child has to work in agriculture. After controlling for endogeneity, the effect of parental education on children's highest grade completed becomes more than quadruple the estimated effects in the random effects model.

Table 5. Effects of aggregated asset index on highest grade completed, children aged 6–18

	Dep. variable: Highest grade completed		
	RE	FE	HTIV
Log(Expenditure per-adult equivalent)	0.163***	0.081**	0.102***
	(0.031)	(0.035)	(0.031)
Asset index	0.127***	0.031**	0.045***
	(0.011)	(0.014)	(0.011)
School in village (1=Yes, 0=No)	0.204***	0.284***	0.352***
	(0.064)	(0.083)	(0.071)
Max parent's education	0.309***	-	1.382***
	(0.026)		(0.108)
Household size	-0.024**	-0.036**	-0.036***
	(0.012)	(0.015)	(0.013)
Gender (1=Male, 0=Female)	-0.320***	-	-0.320***
	(0.054)		(0.065)
Age	0.690***	0.702***	0.696***
	(0.007)	(0.009)	(0.006)
Head's age	0.020***	0.026***	0.019***
	(0.002)	(0.003)	(0.002)
Head's Gender (1=Male, 0=Female)	-0.151**	-0.220**	-0.061
	(0.069)	(0.096)	(0.066)
Head's Marital status (1=Married)	-0.016	-0.024	-0.016
	(0.019)	(0.022)	(0.017)
Rural (1=Yes, 0=Urban)	-0.168***	0.165**	0.085
	(0.053)	(0.066)	(0.053)
Negative [economic] shock (1=Yes)	-0.017	-0.035	-0.008
	(0.026)	(0.027)	(0.026)
Ever attended school (1=Yes, 0=No)	6.445***	-	5.961***
	(0.228)		(0.197)
Number of children 18 or under	0.034**	0.068***	0.071***
	(0.017)	(0.020)	(0.018)
Constant	-12.33***	-5.04***	-14.88***
	(0.484)	(0.470)	(0.528)
Observations	15471	15471	15471

Notes: Standard errors in parentheses are clustered at the individual level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. Results are based on panel of children who were 6 to 18 years old in 2008. RE, FE, and HTIV stand for Random Effects, Fixed Effects, and Hausman-Taylor Instrumental Variable estimators, respectively.

Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

Among other covariates, increase in household size decreases the highest grade completed but increase in number of school-aged children increases it – a positive sibling effects. Having one or more siblings may reduce labor burden to one child and also siblings can share resources, help each other in homework and even can be a companion to walk to school. Interestingly, having a male head of household adversely effects children's grade level, but girls are more likely to reach higher grades than boys. This is consistent with evidence from other developing countries that boys are more likely than girls to forgo school for agricultural activities because girls usually take care of household and kitchen activities (Akresh et al., 2013; Burke and Beegle, 2004). While the level of children's education increases with both children's age as well as household's age, household head's marital status does not matter. As expected, school attendance increase the grade level by about 6 grades indicating that majority of children who attend school reach at least 6 grades and they likely drop out before the PSLE exam in the 7^{th} grade.

Table 6 disaggregates assets into household durables, agricultural assets, and housing quality assets. Although the results in Table 5 suggest that assets uniformly contribute to child education through positive wealth effects, it appears from Table 6 that different types of assets have differential effects. Household durables and housing quality characteristics have the expected positive effects but agricultural assets have negative effects on highest grade completed. Since we use weighted indexes as variables of interest, our primary interest is in the direction of effects rather than the magnitude because the practical significance of the size of the estimated coefficient on weighted index is less meaningful. Nevertheless, a one unit increase in agricultural asset index decreases children's highest grade completed by 0.02. Specifically, all else constant, providing one head of cattle and 20 chickens or one reaper, one plough, and one harvesting machine increases the agricultural asset index by one unit and therefore decreases children's highest grade by 0.02. In contrast, a one unit increase in household durable index (equivalent to a radio, TV, computer, and cell phone) and a housing quality

index increase children's highest grade by 0.04 and 0.08, respectively. While these effects are modest in magnitude, the difference in direction of impact is of practical significance.

Table 6. Effects of different assets on highest grade completed, children aged 6–18

	Dep. variable: Highest grade completed		
	RE	FE	HTIV
Log(Expenditure per-adult equivalent)	0.129***	0.068**	0.081***
	(0.031)	(0.035)	(0.031)
Household durable index	0.080***	0.036**	0.043***
	(0.013)	(0.015)	(0.013)
Agricultural asset index	-0.014***	-0.017***	-0.018***
	(0.004)	(0.004)	(0.005)
Housing quality index	0.161***	0.069***	0.084***
	(0.015)	(0.019)	(0.017)
School in village (1=Yes, 0=No)	0.225***	0.292***	0.356***
	(0.064)	(0.084)	(0.071)
Max parent's education	0.282***	-	1.251***
	(0.026)		(0.107)
Gender (1=Male, 0=Female)	-0.318***	-	-0.319***
	(0.053)		(0.064)
Other controls	Yes	Yes	Yes
Observations	15471	15471	15471

Notes: Standard errors in parentheses are clustered at the individual level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. Results are based on panel of children who were 6 to 18 years old in 2008. RE, FE, and HTIV stand for Random Effects, Fixed Effects, and Hausman-Taylor Instrumental Variable estimators, respectively.
Other control variables include household size, child's age, age, gender, and marital status of the household head, number of children 6 to 18, and indicators for rural residence, negative economic shock, and if the individual has attended school ever.
Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

As agricultural assets include farm tools and equipment, land, and livestock, owning more agricultural assets may raise the opportunity cost of schooling and heighten demand for child labor,

which contributes to school dropout. However, the adverse effect of agricultural assets can be offset by positive income affect and effects of household durables and good housing characteristics, which both have larger positive effects than agricultural assets. The estimated effects of other variables, such as age, gender, household head's characteristics, and other control covariates are not discussed here because estimated coefficients on these variables are qualitatively identical to the coefficients presented in Table 5 and discussed above.

The evidence of the negative effects of agricultural assets on grade level completed is particularly striking because it challenges the view that wealth has a positive effect on education. Agricultural (or any productive) assets are a form of wealth, but they may behave differently than durable assets and housing quality assets in that productive assets may require labor and other inputs to be operational. Ownership of agricultural assets may indicate wealth acquisition but it may raise the opportunity cost of schooling and demand for child labor, especially for agrarian households that have little or no access to other labor markets. From the evidence, we argue that an undifferentiated view of assets is misleading. Because ownership of agricultural assets raises the likelihood of child labor in own-farm activities (see Appendix Table A3), presumably the opportunity cost of schooling rises with agricultural assets through an effect on child labor for farming.

To discern more precisely which specific assets drive the observed effects of agricultural assets, durable assets and household quality on children's highest grade completed, we disaggregate agricultural assets into small tools, large equipment, livestock, and land holding; household durables into information related assets, transportation assets, and other durables; and housing quality into home ownership, good quality housing, access to electricity, and access to safe drinking water. Results presented in Table 7 indicate that, controlling for consumption and other covariates as in Tables 5 and 6, the negative effects of agricultural assets mainly comes from large agricultural equipment. Similarly, the positive effects of household durables primarily comes from consumer durables other

than transportation and information related assets and that of housing quality primarily comes from home ownership, access to safe drinking water, and access to electricity. Specifically, one unit increase in count of large agricultural equipment decreases children's grade completed by 0.05, but one unit increase in count of durable assets is associated with 0.02 point increase in the grade completed. Similarly, home ownership and access to electricity increase children's grade completed by 0.16, and 0.13 points, respectively.

Table 7. Effect of specific assets on children's highest grade completed in Tanzania

	Dep variable: highest grade completed		
	RE	FE	HTIV
Log (Expenditure per adult)	0.173***	0.078**	0.104***
	(0.032)	(0.036)	(0.032)
Agricultural assets			
No. of small agricultural tools	-0.000	-0.004	-0.006
	(0.007)	(0.008)	(0.008)
No. of large agricultural equipment	-0.052**	-0.042*	-0.052**
	(0.020)	(0.024)	(0.024)
Tropical livestock unit	-0.003*	-0.001	-0.002
	(0.002)	(0.002)	(0.002)
Land holding size (Acres)	0.000	0.003	0.002
	(0.003)	(0.003)	(0.003)
Household durables			
No. of information assets	0.005	-0.003	-0.002
	(0.009)	(0.009)	(0.005)
No. of transportation assets	0.019	0.015	0.014
	(0.017)	(0.019)	(0.018)
No. of other durable assets	0.059***	0.022*	0.022**
	(0.010)	(0.012)	(0.010)
Housing characteristics			
Home ownership (1=own 0= else)	0.212***	0.152**	0.161***
	(0.056)	(0.065)	(0.057)
Good quality housing (1=Yes, 0=No)	0.302***	0.005	0.036
	(0.045)	(0.053)	(0.050)
Access to electricity	0.278***	0.201***	0.128**
	(0.062)	(0.073)	(0.059)

Access to safe drinking water	0.099***	-0.006	0.019
	(0.033)	(0.035)	(0.034)
Time to closest water source (mins)	0.000	0.002***	0.001*
	(0.001)	(0.001)	(0.001)
Other controls	Yes	Yes	Yes
Observations	15473	15473	15473

Notes: Standard errors in parentheses are clustered at the individual level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. Results are based on panel of children who were 6 to 18 years old in 2008. RE, FE, and HTIV stand for Random Effects, Fixed Effects, and Hausman-Taylor Instrumental Variable estimators, respectively. Other control variables include household size, child's age, age, gender, and marital status of the household head, number of children 6 to 18, and indicators for rural residence, negative economic shock, and if the individual has attended school ever.
Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

In Table 8, we estimate the HTIV model for various subsamples to identify mechanisms that may be behind the differential effects of different types of assets. We estimate the model for eight subsamples – rural, urban, crop producers, livestock keepers, boys, girls, poor, and non-poor[6] – and find that agricultural assets have larger negative effects and non-agricultural assets have larger positive effects on the highest grade completed of rural children, children of crop producers, girls, and poor children. Although the aggregated asset index has positive effects, we find no evidence of asset-specific effects on educational outcomes of urban children. The results for boys vs. girls and poor vs. non-poor subsamples indicate that while positive wealth effects on child education are consistent in various scenarios, differential effects across asset categories emerge mostly for rural children, poor children, girls, and children from grain crop farmers. The results are consistent with the opportunity cost of schooling rising with increases in agricultural assets only if the household is primarily involved in farming.

[6] We also estimate the model for households that experienced shock in the last 12 months versus households that did not. Our hypothesis is that shocks may influence child labor and consumption (asset accumulation) decision at the same time and may confound the asset-child education relationship. However, we find no evidence that episodes of shocks in the last 12 months influence the asset-education relationships.

Table 8. Effects of different assets on highest grade completed of children ages 6 to 18, under various scenarios

	Dep. variable: Highest grade completed							
	Rural	Urban	Grain crop farmers	Livestock keepers	Boys	Girls	Poor	Non-poor
Log (Expenditure per adult)	0.061*	-0.050	0.133***	0.126***	0.036	0.126***	0.108*	0.114**
	(0.036)	(0.084)	(0.035)	(0.041)	(0.046)	(0.043)	(0.055)	(0.056)
Household durable index	0.082***	0.032	0.057***	0.054**	0.048**	0.041**	0.117***	0.038***
	(0.022)	(0.021)	(0.019)	(0.022)	(0.019)	(0.017)	(0.042)	(0.014)
Agricultural asset index	-0.032***	-0.013*	-0.013*	0.007	-0.015**	-0.023***	-0.038***	-0.017***
	(0.008)	(0.007)	(0.007)	(0.008)	(0.006)	(0.007)	(0.011)	(0.005)
Housing quality index	0.105***	0.050	0.103***	0.085***	0.078***	0.087***	0.068**	0.082***
	(0.023)	(0.033)	(0.022)	(0.025)	(0.024)	(0.023)	(0.031)	(0.022)
School in village (1=Yes, 0=No)	0.215*	0.140	0.403***	0.531***	0.476***	0.245***	0.466***	0.326***
	(0.125)	(0.104)	(0.094)	(0.113)	(0.106)	(0.095)	(0.116)	(0.090)
Max parent's education	0.705***	-1.218***	1.090***	0.918***	1.211***	1.274***	1.368***	1.013***
	(0.148)	(0.426)	(0.141)	(0.149)	(0.145)	(0.157)	(0.170)	(0.144)
Gender (1=Male, 0=Female)	-0.329***	-0.109	-0.300***	-0.292***	-	-	-0.170**	-0.417***
	(0.064)	(0.124)	(0.067)	(0.071)			(0.085)	(0.076)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10935	4536	11678	9380	7786	7685	6718	8753

Notes: Standard errors in parentheses are clustered at the individual level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. Results are based on panel of children who have ever attended school and were 6 to 18 years old in 2008. HTIV stands for Hausman-Taylor Instrumental Variable estimator. Other control variables include household size, child's age, age, gender, and marital status of the household head, number of children 6 to 18, and indicators for rural residence, negative economic shock, and if the individual has attended school ever.
Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

4.2.2. Effects of assets on test performance

Our results so far show that agricultural assets can have negative effects on highest grade completed and these effects emerge mostly from ownership of large agricultural equipment. However, although 'highest grade completed' is a valid measure of school enrollment and grade completion, it does not account for student effort and performance (nor school quality). To this end, we use the PSLE test results to examine the effects of assets on performance on the primary school leaving exam (Table 9) and the FIVE test results to assess the effects of assets on how adolescents perform on form IV test (Table 10).

Still using equation (1), we estimate effects of an aggregated asset index and assets by category on household-level examination pass rates. While the variables of interest are still the same, in the new control covariates, household controls replace all individual controls.[7] Results from the estimations using the aggregated asset index are presented in Appendix Tables A4 and A6. As expected, we find positive wealth effects on children's performance in both the PSLE and the FIVE tests. Appendix Tables A5 and A7 present results from the second specification, where the asset index is disaggregated into three subindexes. The positive effect of assets on PSLE performance mainly comes from household durables. However, unlike 'highest grade completed', PSLE performance is not affected at all by agricultural assets. Similar results also hold for the FIVE tests; the aggregated wealth index has a strong positive effect on the number of FIVE passed children, but agricultural assets have no statistically significant effect.

[7] The new set of control variables are log(Expenditure per adult), education of head, age of head, sex of head, marital status of head, household size, number of children, and binary indicators for residence in the mainland or Zanzibar and economic shock in the last 12 months.

Table 9. Effect of specific assets on children's PSLE performance in Tanzania

	Dep. Variable: Number of PSLE passed children		
	RE	FE	HTIV
Log(Total expenditure)	0.015	0.048**	0.059**
	(0.016)	(0.023)	(0.024)
Agricultural assets			
No. of small agricultural tools	-0.005	0.008	0.007
	(0.006)	(0.008)	(0.007)
No. of large agricultural equipment	-0.050	-0.040	-0.046*
	(0.032)	(0.037)	(0.028)
Tropical livestock unit	-0.003***	-0.003	-0.003**
	(0.001)	(0.002)	(0.002)
Land size (Acres)	-0.001	0.001	0.001
	(0.001)	(0.003)	(0.002)
Household durables			
No. of information assets	0.038***	0.004	0.007
	(0.007)	(0.010)	(0.009)
No. of transportation assets	0.022*	0.020	0.022
	(0.012)	(0.018)	(0.015)
No. of other durable assets	-0.002	-0.012	-0.014
	(0.007)	(0.011)	(0.009)
Housing characteristics			
Home ownership (1=Own, 0=else)	0.108***	0.125**	0.117**
	(0.028)	(0.057)	(0.047)
Housing quality (1=Improved, 0=else)	0.199***	0.062	0.075*
	(0.027)	(0.045)	(0.041)
Access to electricity (1=Yes, 0=No)	0.044	0.078	0.035
	(0.035)	(0.058)	(0.044)
Access to safe drinking water (1=Yes, 0=No)	0.082***	0.005	0.067***
	(0.018)	(0.025)	(0.021)
Time to the closest source of water (mins)	-0.001***	-0.000	-0.001**
	(0.000)	(0.001)	(0.000)
Observations	5692	5692	5692

Notes: Standard errors in parentheses are clustered at the household level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. As the dependent variable is at the household level, no individual characteristics are included in the model. RE, FE, and HTIV stand for Random Effects, Fixed Effects, and Hausman-Taylor Instrumental Variable estimators, respectively. Primary School Leaving Exam (PSLE) is a national examination after 7th grade.

Other control variables include household size, age, education, gender, and marital status of the household head, number of PSLE eligible children, and indicators for rural residence, mainland, and negative economic shock.

Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

Table 9 presents results from our third specification, effects of specific types of assets within each of the three groups of assets – agricultural assets, household durables, and housing quality. Results show that large agricultural equipment and livestock negatively affect PSLE pass rate; increase in livestock ownership by one livestock unit and acquisition of an additional unit of large agricultural equipment decreases the number of PSLE passed children per household by 0.003 and 0.05 units, respectively. While none of the household durable assets have statistically significant effects, housing quality assets are positively associated with the PSLE pass rate. Specifically, home ownership and good quality housing (improved roof, improved wall, and improved floor) increase the number of PSLE passed children by 0.12 and 0.08, respectively. Interestingly, access to safe drinking water increases the number of PSLE pass children per household by 0.07, increase in the distance to the source of water by one minute decreases the number of PSLE passed children by 0.001.

In Table 10, we present results on the effects of specific types of productive and non-productive assets on FIVE test performance. Consistent with the results in the case of PSLE test, large agricultural equipment and livestock ownership are negatively associated with the number of FIVE passed children. Household durable assets have no statistically significant effects but the components of housing quality have positive effects on the FIVE test performance too. Home ownership and good quality housing increases the number of FIVE passed children by 0.10 and 0.13, respectively. In addition, while access to safe drinking water enhances student performances in the FIVE test, increase in the distance to the source of water decreases it, probably due to increase in child labor demand to fetch water. These effects are small in magnitude to be practically meaningful on their own, but the consistency in the size and direction of effects across different educational outcomes highlights the importance of disaggregated analysis of effects of assets on educational outcomes.

Table 10. Effect of specific assets on children's FIVE performance in Tanzania

	Dep. Variable: Number of FIVE passed children		
	RE	FE	HTIV
Log(Total expenditure)	0.035***	0.025	0.033**
	(0.011)	(0.015)	(0.017)
Agricultural assets			
No. of small agricultural tools	-0.002	0.013	0.009
	(0.006)	(0.009)	(0.007)
No. of large agricultural equipment	-0.081***	-0.052*	-0.056**
	(0.026)	(0.029)	(0.025)
Tropical livestock unit	-0.004***	-0.002	-0.002
	(0.002)	(0.002)	(0.002)
Land size (Acres)	-0.003*	-0.001	-0.002
	(0.001)	(0.003)	(0.002)
Household durables			
No. of information assets	0.007	-0.000	0.003
	(0.007)	(0.010)	(0.009)
No. of transportation assets	0.039***	0.022	0.022
	(0.013)	(0.020)	(0.015)
No. of other durable assets	0.003	-0.003	-0.007
	(0.007)	(0.010)	(0.009)
Housing characteristics			
Home ownership (1=Own, 0=else)	0.129***	0.126**	0.103**
	(0.027)	(0.054)	(0.045)
Housing quality (1=Improved, 0=else)	0.234***	0.105**	0.126***
	(0.026)	(0.044)	(0.040)
Access to electricity (1=Yes, 0=No)	0.048	0.114**	0.021
	(0.033)	(0.056)	(0.042)
Access to safe drinking water (1=Yes, 0=No)	0.091***	-0.024	0.069***
	(0.019)	(0.028)	(0.022)
Time to the closest source of water (mins)	-0.001***	-0.000	-0.001***
	(0.000)	(0.001)	(0.000)
Observations	5901	5901	5901

Notes: Standard errors in parentheses are clustered at the household level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. As the dependent variable is at the household level, no individual characteristics are included in the model. RE, FE, and HTIV stand for Random Effects, Fixed Effects, and Hausman-Taylor Instrumental Variable estimators, respectively. Form IV Exam (FIVE) is a national examination after 11th grade.

Other control variables include household size, age, education, gender, and marital status of the household head, number of PSLE eligible children, and indicators for rural residence, mainland, and negative economic shock.

Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

Among other variables, household consumption expenditure has a positive effect on the number of PSLE and FIVE passed children, suggesting a positive effect on child educational outcomes. Similarly, household head's education contributes to enhanced performances in both tests, but unlike the effects on 'highest grade completed', having a school in the village has no effect on children's performance on either test. One possible implication is that students who are doing well and still in school may find it worthwhile to travel farther to a nearby community for schooling, but students who are not doing well may drop out when school is farther away.

4.2.3. Robustness check

We run several alternative specifications for all three outcome variables – highest grade completed, the number of PSLE passed children, and the number of FIVE passed children – and the results are consistent with the findings from the main specifications. To examine whether consumption is absorbing the effects of assets on child education (through "income effects"), we exclude the consumption expenditure variable from the model specification and estimate the effects of different types of assets. The result is that excluding consumption expenditure slightly amplifies the negative effects of agricultural assets (the coefficient estimate increases from –0.018 to –0.0183) and the positive effects of both household durables (0.043 to 0.047) and housing quality (0.084 to 0.089). A similar pattern holds for both PSLE and FIVE performances: no statistically significant change in the effects of agricultural assets but effects of other assets increase more. Therefore inclusion of consumption in our preferred specification as a control for the overall well-being of the household does not alter our findings qualitatively.

We also estimate our preferred model for the sample of households that experienced shock in the last 12 months versus households that did not. Our hypothesis is that shocks may influence child labor and consumption (asset accumulation) decision at the same time and may confound the asset-

child education relationship. However, we find no evidence that episodes of shocks in the last 12 months influence the asset-education relationships.

5. Conclusion

There is considerable empirical evidence that household wealth contributes to child education. Despite the positive effect of household wealth, empirical evidence on how different components of wealth (different assets) contribute to child education is limited. This paper tests a hypothesis that different types of assets have differential effects on child educational outcomes. We use three waves of nationally representative panel data from Tanzania and find that while non-productive assets (such as household durables and housing quality) are positively associated with child educational outcomes, agricultural assets have negative effects on both children's highest grade completed and school performances, presumably through increased child labor demand.

We use the Hausman-Taylor Instrumental Variable (HTIV) panel data estimator to consistently estimate the effects of time-varying and time-invariant endogenous repressors and find that the negative effects of agricultural assets emerge from large agricultural equipment and livestock ownership. This implies that agricultural assets may increase the opportunity cost of schooling when labor and credit markets are imperfect. That agricultural assets can have negative effects on child education because they increase opportunity cost of schooling is substantiated with the evidence of larger negative effect of agricultural assets for children working in household agricultural activities. Our finding that the negative effects of agricultural assets are amplified for rural children, poor children, and children of crop producers also reinforces the inference that the negative effect of agricultural assets operates through child agricultural labor.

Unlike agricultural assets, household durables and housing quality are not complements to child labor and are therefore unlikely to increase the opportunity cost of schooling. Indeed, these

assets are positively associated with both grade completed and exam performance. Household durables and housing quality are part of household's consumption decisions and the positive effects of these assets could be a standard wealth-effect story. Although not statistically tested in the analysis, these assets may also lead to better child education through enhanced economic security and reduced economic stress for parents. We argue that in addition to wealth effects, electricity may make studying more efficient, a closer source of water frees up some time for studying that would have been used for water fetching, and access to safe water and good sanitation facilities may improve school performance through improved child health.

Even though assets overall serve as a good predictor of child educational performance, interventions to enhance agricultural assets may not be favorable for education outcomes in the near term. If increased child education is an intended goal, transferring agricultural assets may not yield the desired result. Nonetheless, there may be ways to increase agricultural asset holdings without compromising educational outcomes. Since the negative effect likely emerges through child labor in agriculture, making an asset-based policy intervention conditional on school attendance or 'no child labor in agriculture' may enhance household welfare without hurting child education—although applying such a policy may be extremely difficult. Another implication of our findings is that transferring agricultural assets to parents in combination with awareness training or adult education for them, or establishing a public school in the target community may mitigate the potential adverse effects of agricultural assets on child education.

In the longer term, agricultural assets may generate income that is invested in household durables and housing quality, forms of wealth that facilitate school attendance and performance. In the short term, programs that help households accumulate durable assets or improve housing quality could be incorporated into policy interventions for improving both household welfare and child education. Although such policy interventions are rare, our empirical findings suggest that

interventions that combine transfers of agricultural with household durable or housing quality assets may both heighten household socioeconomic status and temper the possible negative effect of agricultural assets. Since we control for household income, our findings should hold regardless of household income. One caveat is that this study does not consider the threshold of income or asset holdings above which change in the value of assets held may have no effect because demand for child education is inelastic to the opportunity cost of schooling.

The main lesson from this study is that considering all the assets a household possesses as an aggregate measure of household wealth may be misleading because different types of asset have differential effects on child education, something that may also be true for other outcomes. The evidence that, even after controlling for household income, asset ownership has a statistically significant positive effect on child education but the effect differs by type of assets, is a novel finding that warrants further exploration. If similar findings hold for other countries and contexts, that should help researchers and policymakers to design interventions that promote the accumulation of assets while being attentive to both their direct and indirect effects on the wellbeing of the household.

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Appendix A

Table A1. Pooled scoring factors and baseline summary statistics of asset variable

Household durables	Mean	Scoring factors	Agricultural assets	Mean	Scoring factors	Housing quality characteristics	Mean	Scoring factors
Radios	0.82	0.14	Hoes	2.09	0.08	Home ownership (1=Yes 0=No)	0.79	-0.22
TVs	0.21	0.35	Spraying machines	0.05	0.16	Number of rooms	0.28	0.35
Telephones	0.03	0.12	Water pumps	0.02	0.16	House wall (1=cement/concrete, 0=else)	0.62	0.27
Mobile phone	0.74	0.29	Reapers	0.003	0.41	House roof (1=metal sheets 0=else)	0.42	0.37
Refrigerators	0.14	0.33	Tractors, trailers	0.01	0.37	House floor (1=concrete/cement/tiles 0=else)	2.74	0.04
Sewing machines	0.14	0.17	Ploughs, harrows	0.07	0.17	Safe water (1=protected, boiled, filtered 0=else)	0.66	0.23
CDs, DVDs, music systems	0.25	0.30	Harvesters/threshers	0.001	0.46	Water hauling time (Minutes)	20.05	-0.17
Computers	0.12	0.24	Hand miller	0.005	0.23	Access to toilet (1=Yes 0=No)	0.92	0.16
Irons	0.34	0.29	Coffee pulper	0.01	0.31	Toilet type (1=modern, 0=Vault/Pit)	0.07	0.30
Electric/gas stoves	0.08	0.27	Fertilizer distributors	0.002	0.45	Electricity (1=Yes 0=No)	0.21	0.39
Water heaters	0.05	0.25	Livestock	3.43	0.08	Fuel(1=electricity/gas/generator/solar,0=else)	0.21	0.39
Cars	0.05	0.25	Poultry	5.68	0.05	Cooking fuel (1=firewood 0=else)	0.72	-0.36
Motor cycles	0.04	0.12	Outboard engines	0.05	0.03			
Bicycles	0.49	0.04	Land size (Acres)	3.56	0.07			
Boats/canoes	0.01	0.01	Carts	0.03	0.09			
Fan/ACs	0.21	0.30	Wheel barrows	0.04	0.10			
Dish antennas	0.15	0.29						
Observations	3082	3082		3082	3082		3082	3082

Notes: All asset variables are in count, unless otherwise indicated. Asset indexes calculated by using binary indicators of asset ownership are not qualitatively different from the indexes resulting from count variables. Scoring factor is the weight that is used to calculate the first principal component. The first component explains 32 % variance in durable assets, 25% variance in agricultural assets, and 39% variance in housing quality characteristics.

Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

Table A2. Variable categories in the Hausman-Taylor framework

Time-varying variables	Time-invariant variables
A.) Exogenous (X_{1it})	*C.) Exogenous (Z_{1i})*
1. Age	1. Sex
2. Age of the household head	2. Ever attended school
3. Marital status of the household head	
4. Sex of the household head	
5. Shock in the last 12 months	
6. Number of siblings	
7. School in the village	
8. Indicator for rural residence	
B.) Endogenous (X_{2it})	*D.) Endogenous (Z_{2i})*
1. Agricultural asset index	1. Parental education
2. Durable asset index	
3. Housing quality index	
4. Consumption expenditure	
5. Household size	

Table A3. Likelihood of child labor on own-farm agriculture

	Model: Pooled Probit			
	Rural	Urban	Crop producers	Livestock keepers
Log (Expenditure per-adult equivalent)	0.123***	-0.029	0.115***	0.131***
	(0.027)	(0.058)	(0.027)	(0.029)
Household asset index	-0.002	0.012	0.003	-0.019
	(0.016)	(0.015)	(0.013)	(0.014)
Agricultural asset index	0.018***	-0.009*	0.014**	0.008
	(0.007)	(0.005)	(0.006)	(0.006)
Housing quality index	-0.215***	-0.206***	-0.168***	-0.136***
	(0.015)	(0.022)	(0.014)	(0.015)
School in village (1=Yes, 0=No)	0.782***	0.416***	0.686***	0.567***
	(0.104)	(0.103)	(0.082)	(0.095)
Max parent's education	-0.107***	-0.033	-0.104***	-0.083***
	(0.017)	(0.030)	(0.016)	(0.016)
Household size	-0.046***	-0.086***	-0.051***	-0.053***
	(0.011)	(0.020)	(0.010)	(0.011)
Gender (1=Male, 0=Female)	0.170***	0.196***	0.179***	0.174***
	(0.030)	(0.065)	(0.029)	(0.031)
Age (years)	0.096***	0.047***	0.097***	0.097***
	(0.004)	(0.008)	(0.004)	(0.004)
Head's age	0.005***	0.013***	0.004***	0.005***
	(0.001)	(0.003)	(0.001)	(0.001)
Head's gender (1=Male, 0=Female)	0.067	-0.064	0.003	-0.009
	(0.051)	(0.124)	(0.051)	(0.054)
Head's marital status (1=Married)	0.029*	-0.026	0.026*	0.011
	(0.015)	(0.035)	(0.015)	(0.016)
Rural (1=Rural, 0=Urban)	-	-	0.353***	0.402***
			(0.048)	(0.053)
Negative [economic] shock (1=Yes)	0.083***	0.157***	0.072***	0.067**
	(0.028)	(0.060)	(0.026)	(0.029)
Number of children 18 or under	0.084***	0.117***	0.088***	0.092***
	(0.015)	(0.028)	(0.014)	(0.015)
Constant	-4.627***	-2.404***	-4.584***	-4.700***
	(0.388)	(0.800)	(0.374)	(0.416)
Observations	10935	4539	11679	9380

Notes: Standard errors in parentheses are clustered at the individual level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. Dependent variable is child labor in agriculture (1= yes, 0 = no) and the results are obtained from pooled probit model.

Data Source: LSMS-ISA Tanzania National Panel Survey (TZNPS), first three waves.

Table A4. Effect of asset ownership on primary school leaving exam (PSLE) performance

	Dep. variable: Number of PSLE passed children		
	RE	FE	HTIV
Log(Expenditure per-adult equivalent)	0.032*	0.046**	0.051**
	(0.016)	(0.023)	(0.023)
Aggregate asset index	0.048***	0.016	0.021*
	(0.006)	(0.014)	(0.011)
School in village	0.038*	0.054*	0.039*
	(0.021)	(0.030)	(0.022)
Head: education	0.075***	-	0.200***
	(0.011)		(0.064)
Head: age	0.006***	0.006***	0.006***
	(0.001)	(0.002)	(0.001)
Head: Gender (1=Male, 0=Female)	-0.031	-0.059	-0.064
	(0.031)	(0.081)	(0.039)
Head: Marital status (1=Married, 0=else)	0.004	0.004	0.014
	(0.010)	(0.016)	(0.010)
Household size	-0.042***	-0.030***	-0.023***
	(0.006)	(0.011)	(0.007)
Mainland (1=Yes, 0=No)	0.219***	-	0.204***
	(0.036)		(0.059)
Rural (1=Yes, 0=No)	-0.111***	-0.083	-0.104**
	(0.029)	(0.067)	(0.052)
Negative [economic] shock (1=Yes)	-0.013	-0.013	-0.014
	(0.017)	(0.023)	(0.017)
Number of youth 14-24	0.294***	0.230***	0.262***
	(0.013)	(0.019)	(0.013)
Constant	-0.866***	-0.602*	-1.493***
	(0.241)	(0.352)	(0.358)
Observations	5691	5691	5691

Notes: Standard errors in parentheses are clustered at the household level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. As the dependent variable is at the household level, no individual characteristics are included in the model. RE, FE, and HTIV stand for Random Effects, Fixed Effects, and Hausman-Taylor Instrumental Variable estimators, respectively. Primary School Leaving Exam (PSLE) is a national examination after 7th grade.

Table A5. Effect of different assets on PSLE performance of children ages 10 to 20

	Dep. variable: Number of PSLE passed children		
	RE	FE	HTIV
Log(Expenditure per-adult equivalent)	0.024	0.046**	0.051**
	(0.016)	(0.023)	(0.023)
Household asset index	0.020***	0.008	0.011
	(0.007)	(0.012)	(0.010)
Agricultural asset index	0.001	0.007	0.009
	(0.005)	(0.006)	(0.006)
Housing quality index	0.059***	0.001	0.006
	(0.008)	(0.016)	(0.014)
School in village	0.042**	0.052*	0.034
	(0.021)	(0.030)	(0.022)
Head: education	0.072***	-	0.226***
	(0.011)		(0.063)
Head: age	0.005***	0.006**	0.006***
	(0.001)	(0.002)	(0.001)
Head: Gender (1=Male, 0=Female)	-0.036	-0.059	-0.075*
	(0.031)	(0.081)	(0.039)
Head: Marital status (1=Married, 0=else)	0.002	0.004	0.014
	(0.010)	(0.016)	(0.010)
Household size	-0.042***	-0.031***	-0.025***
	(0.006)	(0.011)	(0.007)
Mainland (1=Yes, 0=No)	0.217***	-	0.222***
	(0.036)		(0.059)
Rural (1=Yes, 0=No)	-0.097***	-0.093	-0.126**
	(0.029)	(0.067)	(0.053)
Negative [economic] shock (1=Yes)	-0.014	-0.014	-0.016
	(0.017)	(0.023)	(0.017)
Number of youth 10-20	0.294***	0.231***	0.261***
	(0.013)	(0.019)	(0.013)
Constant	-0.748***	-0.579*	-1.532***
	(0.242)	(0.352)	(0.359)
Observations	5691	5691	5691

Notes: Standard errors in parentheses are clustered at the household level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. As the dependent variable is at the household level, no individual characteristics are included in the model. RE, FE, and HTIV stand for Random Effects, Fixed Effects and Hausman-Taylor Instrumental Variable estimators, respectively and PSLE is a national examination after 7th grade.

Table A6. Effect of asset ownership on FIVE performance

	Dep. variable: Number of FIVE passed children		
	RE	FE	HTIV
Log(Expenditure per-adult equivalent)	-0.035**	-0.017	-0.005
	(0.017)	(0.025)	(0.024)
Aggregate asset index	0.041***	0.026*	0.033***
	(0.006)	(0.014)	(0.011)
School in village	0.083***	0.094***	0.100***
	(0.020)	(0.032)	(0.021)
Head: education	0.065***	-	0.192***
	(0.011)		(0.037)
Head: age	0.006***	0.004**	0.007***
	(0.001)	(0.002)	(0.001)
Head: Gender (1=Male, 0=Female)	-0.022	0.041	-0.018
	(0.030)	(0.071)	(0.032)
Head: Marital status (1=Married, 0=else)	0.014	0.033**	0.034***
	(0.010)	(0.017)	(0.010)
Household size	-0.017***	-0.002	-0.012***
	(0.006)	(0.011)	(0.004)
Mainland (1=Yes, 0=No)	0.214***	-	0.174***
	(0.034)		(0.040)
Rural (1=Yes, 0=No)	-0.105***	0.040	-0.016
	(0.029)	(0.072)	(0.037)
Negative [economic] shock (1=Yes)	-0.014	-0.005	-0.009
	(0.017)	(0.024)	(0.017)
Number of youth 14-24	0.275***	0.199***	0.259***
	(0.014)	(0.023)	(0.010)
Constant	-0.111	-0.025	-0.972***
	(0.249)	(0.369)	(0.346)
Observations	5900	5900	5900

Notes: Standard errors in parentheses are clustered at the household level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. As the dependent variable is at the household level, no individual characteristics are included in the model. RE, FE, and HTIV stand for Random Effects, Fixed Effects, and Hausman-Taylor Instrumental Variable estimators, respectively. Form IV exam (FIVE) is a national examination after 11th grade.

Table A7. Effect of different assets on FIVE performance, youth aged 14-24

	Dep. Variable: Number of youths passed FIVE		
	RE	FE	HTIV
Log(Expenditure per-adult equivalent)	-0.040**	-0.015	0.000
	(0.017)	(0.025)	(0.024)
Household asset index	0.013*	0.014	0.018*
	(0.007)	(0.012)	(0.010)
Agricultural asset index	-0.007	0.004	0.005
	(0.004)	(0.006)	(0.005)
Housing quality index	0.059***	0.006	0.015
	(0.008)	(0.017)	(0.014)
School in village	0.090***	0.090***	0.093***
	(0.020)	(0.032)	(0.022)
Head: education	0.063***	-	0.220***
	(0.011)		(0.055)
Head: age	0.006***	0.004*	0.007***
	(0.001)	(0.002)	(0.001)
Head: Gender (1=Male, 0=Female)	-0.022	0.036	-0.041
	(0.030)	(0.071)	(0.036)
Head: Marital status (1=Married, 0=else)	0.013	0.032*	0.035***
	(0.010)	(0.017)	(0.010)
Household size	-0.016**	-0.003	-0.003
	(0.006)	(0.011)	(0.008)
Mainland (1=Yes, 0=No)	0.196***	-	0.189***
	(0.035)		(0.055)
Rural (1=Yes, 0=No)	-0.076***	0.029	-0.040
	(0.029)	(0.072)	(0.049)
Negative [economic] shock (1=Yes)	-0.011	-0.007	-0.013
	(0.017)	(0.024)	(0.017)
Number of youth 14-24	0.276***	0.199***	0.239***
	(0.014)	(0.023)	(0.014)
Constant	-0.044	-0.013	-1.080***
	(0.251)	(0.373)	(0.365)
Observations	5900	5900	5900

Notes: Standard errors in parentheses are clustered at the household level. Significance level: * $p < .10$, ** $p < .05$, *** $p < .01$. As the dependent variable is at the household level, no individual characteristics are included in the model. RE, FE, and HTIV stand for Random Effects, Fixed Effects, and Hausman-Taylor Instrumental Variable estimators, respectively and FIVE is a national examination after 11th grade.