Schooling achievement amongst Zimbabwean children during a period of economic chaos, 2001-2007/8

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1. Introduction

Human capital is an important determinant of economic growth and helps explain growth rate disparities across countries (Barro, 1991, Jacoby and Skoufias, 1997, Lucas Jr, 1988). However, despite the well-established benefits of education, educational achievement remains low in many developing countries. Various reasons affect household decisions about enrolling children in school, and household poverty is considered to be a major determinant of enrollment (Ersado, 2005). Poor household heads frequently have low education levels. Lack of parental education combined with limited financial resources leads to intergenerational persistence of low participation in school. For example, household inability to pay school fees can impede poor children from attending school.

Child labor, which is widespread in developing countries, is considered the main competitor for schooling. Ersado (2005) finds that poverty is positively associated with underage participation in the informal labor market. In extreme situations, entry of children into the labor market leads to withdrawal from school, but it might also impact the ability to remain in an age-appropriate grade. Demand for labor at home such as farming, household chores, and care for younger siblings can prevent a child from attending school on a regular basis, increasing his or her likelihood to repeat. Other factors linked to household economic status, such as nutrition and health, can also affect a child's ability to remain in the correct grade for her age. Poor nutrition at young age can result in learning difficulties later in life (Glewwe, et al., 2001, Wisniewski, 2010).

Illnesses, often associated with inadequate sanitation and more frequent among poor households, can cause school absenteeism and poor performance, affecting a child's likelihood of successfully remaining in the age-appropriate grade. In addition, poor households in rural Zimbabwe are found to delay enrollment of children in school (Zimbabwe. Ministry of Public Service and Social, 2006). If children in poor households are more likely to delay school entry, repeat grades, and withdraw from school, overall schooling attainment of a country will suffer, compromising its long-term economic growth.

Many reasons other than poverty affect schooling decisions: access to credit, school quality, labor market opportunities, parental attitudes toward education, and income shocks (Ersado, 2005, Jacoby and Skoufias, 1997, Weir, 2011). Weir (2011) examines the role of parental attitudes in households school enrolment decisions in rural Ethiopia. The author finds that children having father or mother expressing more positive attitudes toward schooling were more likely to be enrolled, with mother's attitudes having a stronger effect than father's attitudes. However, the author also finds low enrollment rates despite positive attitudes toward schooling, suggesting that limited financial resources constraint school participation. Jacoby and Skoufias (1997) provide empirical evidence that school attendance is responsive to aggregate and idiosyncratic income shocks among poor rural households in India and acts as a form of self-insurance.

In this study, we focus on the dynamic relationship between educational achievement and poverty status amongst rural households in Zimbabwe between 2001 and 2007/8. For Zimbabweans, the decade beginning in 2000 was characterized by economic and social crises, contributing to widespread hardship. For various reasons, the

International Monetary Fund stopped budgetary support to Government in 1999 and the situation rapidly spiraled out of control. In addition, in 2000 government embarked on a poorly planned "fast track" land reform process that abandoned prior principles and accelerated land grabbing and the exodus of white commercial farmers. The process damaged the commercial agriculture sector, reducing availability of maize-the main staple-and exacerbating foreign exchange problems. By mid-2007, hyper inflationary forces were consuming the economy[1].

Since Independence, the Zimbabwean government has placed a high priority on broadening access to primary and secondary schools, but recent turmoil may have adversely affected long-standing investments in access to education. It is important to understand how household conditions affect decisions about school enrollment. Moreover, it is important to understand how the recent economic crisis has affected schooling decisions. If the crisis has led to decisions by the poor to withdraw their children from school, then long-term prospects for broad-based growth may be compromised.

We use the Incomes, Consumption and Expenditure Surveys (ICES) of 2001 and 2007/8, conducted by the Central Statistical Office of Zimbabwe (CSO) to investigate the effect of household economic status on schooling decisions and attainment. More precisely, we address the following: 1) What is the effect of household economic status on schooling achievement in rural Zimbabwe? 2) Has the relationship between household economic status and schooling achievement changed as a result of the economic crisis? 3) Has the economic crisis affected boys schooling achievement differently than girls? Our

[1] The official rate of inflation at the start of 2009 was 231 million percent, but private sector economists put the percentage as high as 65 followed by 107 zeros Pilossof, R. 2009. "Dollarisation in Zimbabwe and teh Death of an Industry." *Review of African Political Economy* 36(120):294-299.

empirical models account for the causality between household economic status and children participation in school as well as enrollment in the age-appropriate grade. We find that the household economic status, proxied by asset index quintiles, is a strong predictor of schooling attainment. Children in the bottom 20 percent are less likely than all other children to be enrolled in school or attend the age-appropriate grade in both 2001 and 2007/8. The effect of wealth on the probability of school participation is similar between 2001 and 2007/8. However, in 2007/8 children from the wealthiest quintile are less likely to attend the age-appropriate grade, suggesting more difficulties coping with shocks in the latter years than prior to 2001.

The paper is structured as follows. Section 2 describes the method used to measure household economic status, and presents descriptive statistics on schooling achievement. A conceptual framework is introduced in section 3. The empirical specification of our main model is presented in section 4 and estimation results are discussed in section 5. Section 6 consists of robustness checks regarding the validity of the asset index as a measure of economic status. Concluding remarks are given in section 7.

2. Data and method

We combine the fourth ICES, implemented from January through December 2001 containing 12,192 rural and 6,490 urban households, with the fifth ICES, conducted from July 2007 through June 2008 containing 11,221 rural and 2,973 urban households. Both surveys are representative at the national and provincial level. Questionnaires are virtually identical and contain information on socio-demographic characteristics,

incomes, economic activities, and expenditures on more than 230 food and 330 non-food items. In addition, information on the four main types of land use area, i.e. communal areas (CA), resettlement areas (RA), small-scale commercial farms (SSCF), and large-scale commercial farms (LSCF) in rural Zimbabwe is available.

While consumption expenditure is considered to be the preferred measure of current and long-term economic status in developing countries (Deaton, 1997), the consumption expenditure data from the fifth ICES are not suitable for use due to the hyperinflation that characterized the period. With monthly inflation rates exceeding 10,000 percent in Zimbabwe during 2007/8, the real value of consumption expenditures will depend on exactly when the product was purchased. To avoid the problem of hyperinflation, we estimate an asset index as a measure of economic status. Both measures-- asset index and consumption expenditures-- are proxies for unobserved concept of household long-term economic status. Neither measure is perfect; consumption expenditures are subject to short-term fluctuations while estimated weights for the asset index lacks theoretical foundation (Filmer and Pritchett, 2001). The asset index methodology has the advantage of not needing adjustment for price differences over time and space; recall biases are less likely to be a problem as asset ownership can be contemporaneously measured. These factors reduce potential sources of measurement errors for the asset index (Moser and Felton, 2007).

Various studies have demonstrated the usefulness of an asset index to examine determinants of educational and health outcomes in the absence of consumption expenditure data (Case, et al., 2004, Filmer and Pritchett, 1999, Filmer and Pritchett, 2001, McKenzie, 2005) In a study on educational enrollment, Filmer and Pritchett

(2001) examine measurement errors in both proxies for long-term economic status, and find more measurement errors in consumption expenditures in two out of the three countries studied than in the asset index, demonstrating the validity of the later measure.

Use of an asset index as a determinant of children's educational attainment has several advantages compared to consumption expenditures . First, the asset index captures dimensions relevant to educational outcomes other than wealth, such as access to electricity, main source of drinking water, and cooking fuel. By providing good quality lighting, electricity can reduce the costs associated with studying, potentially improving educational outcomes. Access to piped water reduces time needed to gather water, which should increase school participation (Cockburn and Dostie, 2007, Filmer and Pritchett, 2001).

Second, the potential endogenous relationship between economic status and children's educational achievement is attenuated when using an asset index. When using consumption expenditures as a right-hand side variable in a schooling attendance equation, endogeneity may result because other consumption expenses are directly correlated with expenditures on education. Short-term shocks to consumption expenditures caused by unobserved factors may also affect schooling outcomes; these short-term shocks are much less likely to affect asset ownership. Income variability has been clearly associated with changes in school enrollment (Jacoby and Skoufias, 1997). Since the asset index is a closer representation of permanent income, unobserved factors affecting schooling outcomes are far more unlikely to be correlated with assets compared to consumption expenditures (Filmer and Pritchett, 2001).

The asset index captures current wealth from wage income and nonwage income (profits from farm and nonfarm activities, interest on household assets, and income transfers) as well as intertemporal wealth, and can be viewed as a representation of the household asset accumulation path. This long-term path is not subject to short-term fluctuation (Ersado, 2005). For all these reasons, the simultaneity between child educational participation attainment and economic status should be less problematic when employing an asset index. As a result an asset-based welfare measure is a valuable tool to explain the relationship between educational outcomes and household long-term economic status.

Asset index estimation

A key challenge to employing an asset index is how to combine information on ownership of various assets into a single index. Researchers have employed several related techniques to estimate asset weights. These include factor analysis (FA) (Sahn and Stifel, 2000), principal component analysis (PCA) (Filmer and Pritchett, 2001), multiple correspondence analysis (MCA) (Booysen, et al., 2008), and polychoric PCA (Moser and Felton, 2007). Each method rests on different assumptions and some are more appropriate in certain contexts. However, with all methods, weights are determined based on the statistical relationship between assets. All allow the asset index to be presented by an equation as follows:

$$AI_i = \sum_{j=1}^{n} w_j a_{ij} \qquad (1)$$

AI_i represents the asset index score of household i, a_{ij} is ownership status of asset j, and w_j's are the weights to be estimated.

We considered three categories of variables for the estimation of the asset index: i) durable goods, ii) housing characteristics, and iii) access to sanitation. Eight variables capture the durable goods component: ownership of radio, television, refrigerator, bicycle, automobile, sewing machine, stove, and heater. Variables for housing characteristics are comprised of dwelling type, main cooking fuel source, and access to electricity. Type of toilet facility and main source of drinking and cooking water comprise the sanitation component of the index.

Kolenikov and Angeles (2009) and Moser and Felton (2007) argue that in the presence of categorical variables, polychoric PCA is the most appropriate method for estimating asset weights. Since several variables are categorical, i.e. dwelling type, main cooking fuel, type of toilet facility, and main source of drinking water, we employ this technique. Weights are combined with asset ownership status to create an asset index[2] for each household as specified in equation 1.

In a different study (Larochelle and Alwang), using this asset index we replicate the 2001 poverty levels obtained using per capita expenditures and the official poverty lines by determining the asset poverty lines endogenously. We find that 83 percent of rural households are consistently ranked as poor using per capita expenditures and the asset index. In addition, we demonstrate the validity of the asset index methodology in tracking poverty over time and over space in the absence of valid consumption expenditures data.

Descriptive statistics

[2] The asset index is a relative measure, ranking households according to their long-term economic status. Since the focus of this paper is on the role of the asset index in explaining schooling achievement amongst Zimbabwean children and not the asset index itself, the discussion relative to the estimation and correspondence to expenditure measures can be found in World Bank, 2011.

Our sample is composed of individuals between the age of 6 and 19[3] regardless of school attendance as well as students below the age of 25. This corresponds to 8,986 households in 2001 and 8,542 in 2007/8. More precisely, the 2001 rural sample comprises a total of 23,541 children where 6,260 of them in ages 6-19 are not attending school. In 2007, the sample includes 21,650 observations amongst which 5,478 children are not enrolled in school. Among children attending school in 2001, about 41 percent are found to be in the age-appropriate grade in contrast to about 49 percent in 2007/8 .

Initial insights relative to economic status and school achievement are gained by examining school outcomes combined with asset index quintiles and child age (tables 1 and 2). School enrollment increases significantly for 6-7 years old boys belonging to the first through fourth wealth quintiles and for girls of the same age belonging to the first through third wealth quintiles (table 1). This outcome could be an indication that school fees during the period did not keep up with the inflation, resulting in relatively lower costs of schooling in the latter years. In addition, 12-13 years old girls and 18-19 years old boys belonging to the richest quintile are more likely to be enrolled in school in 2007/8 than in 2001. We take advantage of the artificial cohort nature of the data and examine school enrollment rates amongst 6-7 years old girls in 2001 (which corresponds to the 12-13 years old girls in 2007/8) and 12-13 years old boys in 2001 (which corresponds to the 18-19 years old girls in 2007/8). In 2001, the enrollment rate was 10 percentage points higher for 6-7 years old girls belonging to the wealthiest quintile compared to the poorest quintile. In 2007/8, the wealth gap between 12-13 years old girls

[3] In Zimbabwe, the school system is comprised of 7 years of primary education (also referred as "grade") followed by 6 years of secondary education (also referred as "form"). The lower age limits for primary and secondary school enrollment are 6 and 13 years. A student who has always been in school in the age-appropriate age grade is expected to graduate at 19 years.

from the poorest and richest quintile remains the same, i.e. 10%. A similar trend is observed regarding school enrollment rates among 12-13 years old boys in 2001 and 18-19 years old boys in 2007/8, suggesting that wealth inequity problems prevailing in 2001 could have been carried over in 2007/8.

At the exception of the findings mentioned above, school enrollment declined between 2001 and 2007/8 (table 1). In the latter years, lower school attendance is more prevalent as age increases and occurs more frequently among boys than girls. School enrollment has not significantly changed between 2001 and 2007/8 for 16-19 years old girls, regardless of wealth quintile. However, for boys of the same age, school enrollment fell drastically for the first four wealth quintiles. The 2001 survey reveals that the enrollment rates amongst the 10-13 years old boys were lower for those belonging to the first and second quintiles. More importantly, enrollment rates in the age-appropriate grade for 10-13 years old boys differ greatly with the household economic status (table 1), suggesting that 16-19 years old boys in 2007/8 might have already been falling behind in 2001.

School enrollment is about 8 and 14 percentage points lower in 2007/8 for 14-15 year-old boys and girls, respectively, belonging to the poorest quintile (table 1). This could be an indication that the poorest households did not enroll or withdrew their children from secondary school during the economic turmoil. School enrollment trends in rural Zimbabwe differ from those reported in Thomas, et al. (2004), who investigate educational outcomes during the 1998 economic and financial crisis in Indonesia. The authors find evidence that in the poorest households schooling enrolment of young children deceased but the education of older children was protected.

Boys aged 8-11 belonging to the top 20 percent are about 12% less likely to be enrolled in the age-appropriate grade in 2007/8 compared to 2001 (table 2). However, the general trend for older children (who are enrolled in school) is greater participation in the age-appropriate grade in 20007/8. Statistics on school participation for the same age cohort between 2001 and 2007/8 suggests important dropout rates among boys, which could explain the greater participation in the age-appropriate grade during 2007/8. However, attending the age-appropriate grade is also more frequent for older girls in 2007/8 despite the fact that school attendance remained stable. In summary, children are less likely to be enrolled in school in 2007/8 compared to 2001, with few exceptions including those entering primary school, but based on school attendance, children are more likely to be enrolled in the appropriate age grade.

Regression analyses, motivated by the conceptual framework introduced below, will be performed to deepen our understanding on household educational decisions, and highlights the determinants influencing school participation and enrollment in the age-appropriate grade.

3. Conceptual framework

In order to explain how households make schooling decisions, we develop a conceptual framework based on maximization of utility. We assume that households have the following intertemporal utility function:

$$U_t = \sum_{s=0} \delta^s u(c_{t+s}, c_{t+s+1}, l_{t+s}, l_{t+s+1})$$

which increases at a decreasing rate in current and future consumption (c_t, c_{t+1}) and leisure (l_t, l_{t+1}). The household maximizes expected utility subject to a cash and time

constraint. Adult time is defined by $T_A = L_A - l_A$ and child time, by $T_C = L_C - l_C$ - SC, where L represents labor, l is leisure, and SC is time devoted to school. Adult and child labor is assumed to be perfect substitute in production for each other but with a discount parameter (ς) to capture difference in productivity, such that $L_A = \varsigma L_C$ (Glewwe and Jacoby, 2004).

We assume that education represents an investment in human capital, with a return for old age care. In developing countries, social norms are strong and act as a binding contract across generations, where children take care of their parents in old age. We recognize the simplistic nature of this assumption; education can also be a symbolic consumption good where having educated and successful children contributes to parental utility (Banerjee, 2004). Our assumption is for simplicity and, as a result, schooling does not directly enter the utility function. Investment in human capital is financed through saving, borrowing (if household has access to credit) or by forgoing current consumption.

Assume that at t=1 household makes a school decision. If parents choose to invest in education, parents have school-related expenses of $C_{S,t}$. In addition, the child who attends school is assumed to be unable to work. If parents choose not to invest in education, the child obtains earnings of $w_{C,t} > 0$, which is determined by the household shadow wage.

Assume that k is the time required to complete school. Thus, from $t=1$ to $t=k+1$, investment in human capital sums to schooling expenses plus forgone child earnings, *i.e.* $\sum_{t=1}^{t=k+1} \delta^t S_{C,t} + \sum_{t=1}^{t=k+1} \delta^t w_{C,t}$. Enrolling a child in school decreases the utility between $t=1$ and $t=k+1$ as household forgoes leisure and consumption (assuming that educational investment cannot be financed only through savings or borrowing) to invest in human

capital. If no investment in education is made, the child earns a wage income from *t=1* to *t=k+1* equals to $\sum_{t=1}^{t=k+1} \delta^t w_{C,t}$. Delta is a subjective discount rate and is assumed to depend on household preferences (we return to this point below).

Then, at *t=k +1*, the child who attended (did not attend) school will earn as an adult skilled wage of $w_{A,t}^{S}$ ($w_{A,t}^{U}$), until *t= k+n* , where n is the number of years earning an adult wage.

Since education is considered an investment, it can be analyzed by examining its net present value (NPV), which is obtained by discounting future benefits net of costs. Parents decide to send their child to school by comparing the expected utility derived from the NPV of investing in schooling (2.a) against the NPV of no schooling (2.b):

$$EU\delta^t\left(\sum_{t=k+1}^{t=k+n} \Psi_t w_{A,t}^{S} - \sum_{t=1}^{t=k} S_{C,t} - \sum_{t=1}^{t=k} w_{C,t}\right) \qquad (2.a)$$

$$EU\delta^t\left(\sum_{t=1}^{t=k} w_{C,t} + \sum_{t=k+1}^{t=k+n} \Psi_t w_{A,t}^{U}\right) \qquad (2.b)$$

Ψ is a learning/ productivity parameter reflecting the child learning abilities and future productivity (Glewwe and Jacoby, 2004). If the expected utility of investing in education is greater than the expected utility of no investment in education, then parents will choose to invest in human capital, and send their child to school. Four factors deserve consideration when examining educational investment decisions:1-Labor markets, 2-Credit markets, 3-Household preferences, and 4- Return to education (Glewwe and Jacoby, 2004).

Labor markets

Investment in human capital will be influenced by labor markets since the child wage enters equation 2, the expected utility function derived from the NPV of investing in education. Since adult and child wages are complement, an increase in adult wages will raise children shadow wages, increasing the opportunity cost of education, and potentially lowering school enrollment. In the case of Zimbabwe, we expect a reduction in shadow wages between the two studied periods, as the country suffered from an important economic contraction between 2001 and 2007/8. This contraction should lower the opportunity cost of education, leading to higher enrollment rates in the latter years.

Credit markets

Credit markets are expected to play a role in schooling decisions by allowing the financing of investment in human capital. However, without savings or access to credit, investment in human capital must be made by forgoing current consumption. This means that limited possibilities to smooth consumption through credit and saving can prevent poor households from investing in education (Beegle, et al., 2006, Grimm, 2011, Jacoby and Skoufias, 1997). Including the household economic status in a model of school decisions can provide us information regarding how households face borrowing constraints.

Household preferences

Household preferences such as consumption now versus in the future or quality versus quantity children are expected to influence schooling decisions by influencing the discount rate. While household preferences are not directly observable, they are strongly correlated with observed household characteristics such as age, education, and gender of the household head (Weir, 2011) and its other members.

How are these factors expected to affect schooling decisions? First, young parents likely will have higher discount rates than older ones and will thus be less likely to postpone current for future consumption. Second female-headed household may need more financial support in old age, thus placing higher weights on future benefits associated with education. Third, larger households may reflect lower shadow wages for children and lower opportunity costs of children, all else held constant.

Return to education

Returns to education depend heavily on uncertain future adult wages, which in turn depend on future economic conditions. Parents will adjust their perceptions of benefits from schooling according to each child characteristics, reflected by the learning/productivity parameter in equation 2. For example, the expected adult wage for a male is likely to differ from that of a female. Characteristics unobserved to the researchers, such as child learning abilities, but observed to some extent by the parents will also impact the benefits associated with schooling. It is unclear whether the perceived future benefits of education are higher or lower during a period of economic recession. One could argue that during a period of economic hardship where employment opportunities are minimal, the benefits of education decreases, reducing the demand for schooling. On the other hand, education might be perceived as necessary to obtain a job, increasing its demand. Based on the education data, we hypothesize that benefits of education remain high during the crisis as more girls finish primary school and boys finish secondary school among wealthy households in the latter period. In addition, more children are enrolled in the age-appropriate grade. Last, the proximity and quality of

schools should increase the benefits associated with education, increasing the likelihood of school participation.

4. Empirical Model

We do not observe directly the NPV of the educational investment, but we observe whether a child is enrolled in school or not and conditional on school attendance, whether a child attends the age-appropriate grade. These observed outcomes reflect household decisions and are assumed to be associated with the highest expected utility given labor and credit market constraints, household economic status, household preferences, and perceived return to education. We model schooling decisions using a Heckman probit model, and control for factors influencing the NPV of the investing in schooling.

The first equation--the selection equation--has school attendance as the dependent variable. The second equation--the outcome equation--is conditional on school participation and explains whether a child is in the age-appropriate grade or not.

$$S_t = W_t\beta + HHc_t\beta + Cc_t\beta + A_t\beta + L_t\beta + \mu_{1t} \quad (3.a)$$

$$C_t^* = W_t\beta + HHc_t\beta + Cc_t\beta + A_t\beta + L_t\beta + Z_t\gamma + \mu_{2t} \quad (3.b)$$

$$C_t \geq 0, S = 1, C_t = \_, S = 0$$

$$C_t^* = C_t, S = 1$$

$$\mu_1, \mu_2 \sim N(0,1), corr(\mu_1, \mu_2) = \rho \neq 0$$

Whether a child is enrolled in school at *t=1* (*S=1*) or not (*S=0*) will depend on household long-term economic status (W_t), household characteristics (HHc_t), child characteristics (Cc_t), school availability (A_t), and location variables (L_t) (3.a) (see table 3 for descriptive statistics). Given that a child is enrolled in school (*i.e.* if *S=1*), we also observe whether

the child is in age-appropriate grade ($C_t^*=1$) or not ($C_t^*=0$), which is function of the same set of variables plus the exclusion variable (Z_t) (3.b) (discussed below).

To capture the impact of household long-term economic status on schooling decisions, we employ an asset index. To test the hypothesis that household economic status affects schooling decisions, the asset index enters the equations as dummy variables for asset index quintiles. If poor households face financial constraints making optimal schooling decisions unattainable, wealth should have a significant impact on schooling decisions. We use a Wald test to test whether the coefficients across the asset index quintiles are statistically different.

Household characteristics include household head's age, gender, education and main economic activity, and household composition and control for household preferences. Child age and gender enter the model to capture how net benefits from schooling vary by child characteristics. School accessibility is proxied by the distance to the nearest primary school, secondary school, and bus stop. Last, land use areas (CA, RA, SSCF, and LSCF) and provincial dummies represent the location component. Quality and supply of school is also expected to vary with land use areas as resettlement areas and commercial farms have their own schools. Both land use areas and provincial dummies capture differences in labor and credit market conditions and return to education across different regions in Zimbabwe. Last, squared terms for child's age, head's age, and distance to the nearest primary school, secondary school, and bus stop are included in the analysis to control for potential nonlinearity.

In order for the Heckman probit model to be well-identified and have meaningful coefficients, the selection equation must contain at least one variable that is not included

in the outcome equation. To meet this exclusion requirement, we create a dummy variable that denotes whether a child meets the age requirement to enroll in primary school. This variable affects whether a child attends school, but should not affect whether a child is in the age-appropriate grade.

The model is estimated for rural Zimbabwe in 2001 and 2007/8 separately, and then jointly to determine if the coefficients are statistically different between the two surveys.

5. Results

School enrollment

The marginal effects on the probability of being enrolled in school (first-stage selection equation), estimated at the variables sample mean, are reported in table 4 (for 2001) and table 5 (for 2007/8), along with the marginal effects on the probability of being in the age-appropriate grade (the second stage), conditional on school participation. All asset index quintile variables, in both the selection and outcome equations and in both survey years, are significant below the 1 percent level. These results reflect the power of the asset index in predicting school enrollment and being in the age-appropriate grade. In 2001, the probability of attending school increases on average by about 3.2 percentage points for children in the second welfare quintile in comparison to children in the first welfare quintile. Being in the third, fourth, and fifth welfare quintile is associated with 5.4, 7.2, and 6.9 percentage points increases in the probability of being enrolled in school in comparison to being in the first quintile. Therefore, children in the bottom 20 percent are less likely than all other children to be in school.

To determine whether school attendance differs significantly between the second and third, third and fourth, and fourth and fifth asset index quintile, we perform Wald tests. We find that the probability of school enrollment is significantly greater for children in the third asset index quintile compared to those in the second asset index quintile while children belonging to the fourth asset index quintile are more likely to be enrolled in school than children from third asset index quintile. Enrollment probability is not statistically different between children belonging to fourth and fifth asset index, suggesting that children from the top 40 percent have similar (relatively high) probability of being enrolled in school.

In 2007/8, the probability of being enrolled in school is about 4.2 percentage points higher for children of the second asset index quintile compared to children from the first asset index quintile. The enrollment probability increases by 4.7, 6.5, and 9.1 percentage points for children belonging to the third, fourth, and fifth wealth quintile respectively compared to those from the poorest 20 percent (table 5). Children from the second and third asset index quintile have the same probability of enrollment while, being in the fourth asset index quintile statistically increases the probability of enrollment compared to being in the third asset index quintile. In addition, in 2007/8 enrollment probability for children belonging to the fourth wealth quintile is statistically lower than for children from the fifth asset index quintile while this differential was not statistically significant in 2001.

Wald tests indicate that none of the asset index quintile coefficients in the selection equation are significantly different between 2001 and 2007/8 when tested individually or jointly. Results support the assumption that poor household face financial

constraints making optimal school decisions unattainable, constraints that are similar between 2001 and 2007/8. This suggests that the household economic status has a similar effect on the probability of school participation in 2001 and 2007/8, controlling for other factors.

The influence of other determinants of school participation has changed between the two surveys, such as the child's gender. In 2001, boys were about 3 percentage points more likely to be enrolled in school than girls while in 2007/8 the gender gap is no longer significant. The probability of attending school decreases at an increasing rate with age, decreasing on average by about 5 percentage points per additional year in both 2001 and 2007/8.

The probability of school participation is 1.5 percentage points lower for children living in male-headed households compared to those living in female-headed households in 2001. The penalty of living in a male-headed household on school enrollment increases to 3.5 percentage points in 2007/8. This could be an indication that the perceived benefits of education by female heads increased more than by male heads during the period of economic crisis; women household heads may greater appreciate the role of children in providing old-age security following the period of economic turmoil. This result is clearly consistent with our expectations that an increase in the future benefits of schooling will positively influence school enrollment and is consistent with Weir (2011) who finds that respondents with fewer opportunities to benefits from children education are less likely to hold positive attitudes toward schooling.

The impact of the head's education has become a stronger determinant of school enrollment in the latter years. In 2001, children living in a household where the head

completed secondary school were about 8 percentage points more likely to attend school compared to children whose head had no formal education. This probability differential grew to 13.1 percentage points in 2007/8. The change is even of greater magnitude when the head completed post-secondary education; the probability of school participation is 5.4 percentage points higher in 2001 compared to 16.4 percentage points higher in 2007/8 for children whose household head completed post-secondary education compared to those whose head had no formal education. This is consistent with the assumption that the difficult economic conditions and poor employment opportunities have increased the perceived benefits of education among the most educated heads (those with secondary and post-secondary education). Our results also indicate that household preferences for schooling is strongly influence by the educational achievement of the household head.

The employment sector of the household head also reflects household preferences for schooling. The probability of school participation amongst children headed by other type of workers was 5.3 and 8.6 percentage points higher in 2001 and 2007/8, respectively, than for children whose head is a permanent paid employee.

In terms of household composition, we find as expected that the number of young siblings reduces the likelihood of being enrolled in school, reflecting the higher demand for child labor at home and higher opportunity cost of schooling. One additional sibling between 0-5 years old decreases the probability of school enrollment by over one-percentage points in both survey years. The number of adults within a household is a significant determinant of school participation only in 2007/8. As expected, the high unemployment rates that prevailed during the economic crisis reduced shadow wages, lowering the opportunities costs of going to school. One additional adult member

increases the likelihood of school participation by about one percentage point, which is consistent with our assumption that household labor availability influences schooling decisions.

In 2001 and 2007/8, both the distance to the nearest primary school and nearest secondary school has a significant and negative impact of school enrollment, while the distance to nearest bus stop is insignificant. This is consistent with our theory: school accessibility lowers the cost of schooling and increases school participation.

As expected schooling decisions differ with land use area in Rural Zimbabwe. In 2001, children living on SSCF were 3.7 percentage points more likely to be enrolled in school than children from CA. On the other hand, living on LSCF reduces the likelihood of school participation by 7.6 percentage points compared to living on CA. These results are consistent with our expectations and reflect the better (more difficult) conditions faced by households living on SSCF (LSCF). Various changes occurred in rural Zimbabwe following the fast-track land reform, which affected household schooling decisions. In 2007/8, children living on SSCF and RA were 9.5 and 2.8 percentage points less likely to be enrolled in school than children from CA.

Enrollment in the age-appropriate grade

In 2001, the probability of being in the age-appropriate grade[4], conditional on school participation, is about 4.5 percentage points higher, on average, among children in the second wealth quintile compared to those in the bottom 20 percent (table 4). Compared to the poorest quintile, being in the third, fourth, and fifth asset index quintile increases the probability of being in the age-appropriate grade by about 8.4, 8.2,and 14.6

[4] The Wald test for the independence between the selection and outcome equation has a p-value of zero for both 2001 and 2007/8. This indicates that the null hypothesis is strongly rejected and selection bias would arise if the two equations were estimated separately.

percentage points, respectively. Children in the third asset index quintile are more likely to be in the age-appropriate grade compared to children in the second quintile. Being in the top 20 percent is associated with a significantly higher likelihood of being in an age-appropriate grade compared to the fourth wealth quintile.

Attending the age-appropriate grade is more closely related to the notion of school achievement than school enrollment. Our results suggest that household economic status is a stronger predictor of attending the age-appropriate grade than being enrolled in school in 2001. Since being enrolled in an age-appropriate grade is correlated with previous schooling shocks, our results suggest that children from poor households have experienced more shocks, or are in households that are less able to manage the shocks, than children from less poor households.

In 2007/8, the probability of being enrolled in the appropriate grade is 3.3 percentage points higher for children belonging to the second asset index quintile compared to those belonging to the poorest. Children in the third, fourth, and fifth asset index quintiles are 5.7, 8.9, and 8.5 percentage points more likely to be in the age-appropriate grade than children in the poorest quintile. The probability of a child being enrolled in the appropriate grade given age is significantly different between the second and third asset index quintile and between the third and fourth asset index quintile. There is no statistical difference in the probability of attending the proper age grade for children in the top 20 percent versus those in the fourth wealth quintile in the latter years.

Household economic status in 2007/8 is a less important determinant of school achievement compared to in 2001, as the coefficients for the second, third, and fifth asset index quintiles are smaller in 2007/8. However, a Wald test indicates that the difference

between the 2001 and 2007/8 coefficients is only significant for the fifth quintile. As being enrolled in the age-appropriate grade reflects past schooling shocks, our results suggest that wealthier households faced more shocks or/and more difficulties coping with these shocks prior to 2007/8 compared to years prior to 2001.

Interestingly, conditional on school enrollment, girls are significantly more likely to be enrolled in the age-appropriate grade than boys. This is consistent with our hypothesis that fewer opportunities in the labor market reduces the cost of attending school. In 2001, the probability of being in the proper grade, given child age, was 4.6 percentage points higher for girls than boys. In 2007/8 this probability differential increased to 7.2 percentage points, suggesting that gender discrepancies in the labor market have widen following the economic difficulties.

Similar to school participation, living in a male-headed household reduces the probability a child will be in the age-appropriate grade. Contrarily to school participation, the penalty associated with living in a male-headed household is lower in 2007/8 compared to in 2001 (4.0 versus 2.3 percentage points). The educational attainment of the household head strongly influences the probability of being in the age-appropriate grade. In 2001 (2007/8), the probability is 4.9, 8.8, and 11.6 (2.1, 10.2, and 10.3) percentage points higher for children living in a household whose head completed primary school, secondary school, and post-secondary school, respectively, compared to children living in a household whose head has no formal education, suggesting that preferences for investment in education increases with the educational achievement of the household head. This result is consistent with Weir's findings who reports that low level of formal education is associated with less positive attitudes toward schooling. Since

there is a strong intergenerational persistence of educational achievement (as noted above), increasing the current educational level of all children could benefit the country's long run human capital development.

An additional child of school-age in the household reduces the probability of being enrolled in the age-appropriate grade by only about 0.7 percentage points in 2007/8 while this variable was insignificant in 2001. As for school enrollment, the probability of attending the age-appropriate grade decreases with the number of young children. The penalty of one additional child aged between 0 and 5 years old increases from 0.9 percentage point in 2001 to 2.1 percentage points in 2007/8.

The effect of school accessibility on the probability of being enrolled in the age-appropriate grade is very similar to that of school attendance. Distance to the nearest primary and second school has a negative effect on being in the age-appropriateness grade while distance to the nearest bus stop is insignificant for both, 2001 and 2007/8.

The influence of land area on attending the age-appropriate grade is similar to that of school enrollment. In 2001, the probability of being enrolled in the age-appropriate grade was 9.3 percentage points lower for children of LSCF compared to those living on CA while this differential is no longer significant in 2007/8. On the other hand, children of SSCF and RA are 16.2 and 4.1 percentage points less likely to attend the age-appropriate grade than children from CA in 2007/8 while the difference was not statistically significant in 2001. Our results suggest that the land reform affecting commercial farms had a positive impact on schooling decisions for those living on LSCF and a strong and negative impact for those living on SSCF.

Estimation for girls and boys separately

In order to understand whether the wealth effect on schooling decisions differs with the child's gender, we re-estimate our models (2001 and 2007/8) for girls and boys separately (tables 6-9).

Difference between boys and girls in 2001

In 2001, the impact of wealth on the probability of being enrolled in school is the same for boys and girls at the exception of children belonging to the wealthiest quintile (table 6). Girls in the fifth asset index quintile are 8.5 percentage points more likely to be enrolled in school compared to girls in the bottom 20 percent while this differential about 5 percentage points for boys, suggesting that the household economic status benefits girls participation in school more than boys. Living in a male-headed household reduces significantly school participation only for boys, which might indicate that there is a correlation between the gender of the household head and children participation in the labor market. The educational achievement of the household head is a stronger determinant of school participation for boys than girls in 2001.

The household wealth effect on the probability of attending the age-appropriate grade is generally stronger for girls than boys; the differences are statistically significant for the second, forth, and fifth asset index quintiles (table 7). For example, the probability of being enrolled in the age-appropriate grade is 18.0 and 10.6 percentage points higher for girls and boys, respectively, from the top 20 percent compared to those from the poorest quintile. While enrolled in school, the educational achievement of the household head has similar impact on boys and girls probability of being enrolled in the age-appropriate grade.

Difference between boys and girls in 2007/8

In 2007/8, the wealth impact on the probability of school enrollment is not statistically different between boys and girls (table 8). In addition, the impact of the gender and educational achievement of the household head on enrollment probability does no longer differ between boys and girls, suggesting that a child's gender became a less important determinant of school enrollment decisions in the latter years. However, in 2007/8 household composition has more significant influences on school participation compared to 2001 and differs significantly between boys and girls. For example, one additional adult member increases the probability of being enrolled in school by 1.9 percentage points for boys while this variable is insignificant for girls. This might suggest that boys are more likely to join the labor force than girls when the household is in needs of additional financial resources (like during a period of economic turmoil). In addition, one additional elderly household member reduces the likelihood of school participation by 2.4 percentage points for girls; effect that is not significant for boys, suggesting that the task of care-giving started to compete with girls school participation in the latter years.

Similarly to 2001, the wealth impact on the probability of attending the age-appropriate grade is stronger for girls than boys belonging to the second and fifth asset index quintiles (table 9). Last, the influence of family composition on attending the age-appropriate grade differs from the previous survey and between boys and girls. An additional child between the age of 6 and 19 years and elderly household member significantly reduces the probability of being enrolled in the age-appropriate grade for boys but not for girls. This might suggest that boys bear greatly responsibility in the latter

years to financially support the household (compared to girls and compared to the situation in 2001).

6. Robustness check using 2001 consumption expenditure data

Comparison between consumption expenditures and asset index quintile coefficients using 2001 data

Using the 2001 survey, we re-estimate the model using per capita consumption expenditures as the indicator for household long-term economic status. The results between the two models are consistent (tables 3 and 10). All consumption expenditures quintile coefficients are statistically significant (p-value of zero) but several are of smaller magnitude than the asset index quintile coefficients. The probability of school enrollment increases by 3.5, 4.2, 4.6, and 3.8 percentage points for children belonging to the second, third, fourth, and fifth per capita consumption expenditures quintiles, respectively, compared to those being in the poorest consumption expenditures quintile. These coefficients compared to 3.2, 5.4, 7.2, and 6.9 percentage points increment while using asset index quintiles.

The likelihood of attending the age-appropriate grade increases by 4.1, 6.6, 8.2, and 10.8 (4.5, 8.5, 8.2, and 14.6) percentage points for children belonging to the second, third, fourth, and fifth per capita consumption expenditures (asset index) quintiles respectively compared to those being in the poorest per consumption expenditures (asset index) quintile. Filmer and Pritchett (2001) also find that the gap between rich and poor is generally greater for the index asset. The authors interpret these disparities "as attenuation bias due to greater measurement error in consumption expenditures than

in the asset index. Error here is defined in relation to its use as a proxy for the relevant indicator of economic status in the analysis of education outcomes (p.122)".

7. Conclusion

Schooling is an important determinant of a country's economic future, and during crises, schooling outcomes tend to suffer. Late enrollments and withdrawal of children from school as means of coping with crises can lead to vicious cycles of ever-increasing impoverishment. This paper examines schooling decisions during a period of extended economic crisis in Zimbabwe.

Overall, we find reason for optimism; schooling rates stayed the same for girls between 2001 and 2007/8 and declined slightly for boys. On the other hands, both boys and girls are more likely to be enrolled in the age-appropriate grade in 2007/8 compared to 2001.

We find that wealth is an important determinants of school achievement. Children from the poorest wealth quintile are less likely than any other children to be enrolled or attend the age-appropriate grade. However, contrary to our expectations, there was no change amongst poor households between 2001 and 2007/8. However, children from the wealthiest quintile were about 6 percentage points less likely to attend the age-appropriate grade in 2007/8 than in 2001, making poverty a less distinguishing determinant of schooling achievement in the latter years. It is possible that in a period of hardship households of different socio-economic status resorted erratically to some self-

insurance techniques such as using child labor or withdrawing children from school (Jacoby and Skoufias, 1997).

Wealth has a stronger influence on the probability of attending school for girls than boys in 2001. However, the difference is no longer significant in 2007/8. However, the impact of the household economic status on the probability of being enrolled in the age-appropriate grade is greater for girls than boys in both surveys.

In the latter years, the educational achievement of the household head turned out to be a stronger determinant of school enrollment than household economic status. This strong intergenerational persistence of educational achievement indicates that increasing the current educational level of all children could strongly benefit Zimbabwe's long run human capital growth.

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Table 1: School enrollment rates per asset index quintiles and age group, rural Zimbabwe 2001 and 2007/8

		School enrollment					
		2001		2007/8		%Δ (2001-7/8)	
AGE	Quintile	Male	Female	Male	Female	Male	Female
6-7	1	61%	72%	72%	78%	11%*	6%*
	2	72%	69%	78%	81%	6%*	11%*
	3	72%	72%	80%	80%	8%*	8%*
	4	77%	82%	84%	84%	8%*	2%
	5	74%	82%	78%	84%	4%	2%
8-9	1	92%	95%	90%	94%	-2%	-1%
	2	94%	95%	92%	95%	-1%	-1%
	3	95%	99%	93%	97%	-2%	-2%
	4	96%	94%	93%	95%	-3%	1%
	5	98%	98%	95%	95%	-2%	-2%
10-11	1	93%	93%	87%	93%	-6%*	0%
	2	95%	96%	92%	97%	-3%	1%
	3	99%	97%	96%	94%	-3%*	-3%*
	4	99%	98%	93%	96%	-6%*	-3%
	5	98%	99%	97%	97%	-1%	-2%
12-13	1	89%	89%	79%	88%	-10%*	-2%
	2	92%	93%	90%	92%	-3%	-1%
	3	94%	94%	87%	92%	-7%*	-2%
	4	94%	93%	90%	93%	-4%	0%
	5	94%	90%	92%	97%	-2%	7%*
14-15	1	68%	65%	60%	51%	-8%*	-14%*
	2	79%	73%	76%	76%	-3%	3%
	3	82%	75%	66%	74%	-16%*	-1%
	4	84%	81%	74%	85%	-10%*	4%
	5	86%	85%	80%	73%	-6%	-12%*
16-17	1	51%	36%	39%	33%	-13%*	-3%
	2	55%	39%	42%	38%	-12%*	-1%
	3	61%	52%	50%	53%	-11%*	1%
	4	63%	50%	49%	48%	-14%*	-2%
	5	58%	49%	65%	53%	6%	4%
18-19	1	26%	10%	18%	9%	-8%*	-1%
	2	29%	15%	21%	16%	-8%*	1%
	3	24%	14%	20%	17%	-4%*	3%
	4	30%	13%	18%	16%	-12%*	3%
	5	23%	11%	33%	16%	9%*	5%
Total		**76%**	**74%**	**73%**	**75%**	**-3%***	**1%**

* Difference between 2001 and 2007/8 is statistically significant at the 5 percent level.

Table 2: Enrollment in the age-appropriate grade, given school participation, per asset index quintiles and age groups, rural Zimbabwe 2001 and 2007/8

		Correct grade					
		2001		2007/8		Difference	
AGE	Quintile	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
6-7	1	1	1	1	1	0%	0%
	2	1	1	1	1	0%	0%
	3	1	1	1	1	0%	0%
	4	1	1	1	1	0%	0%
	5	1	1	1	1	0%	0%
8-9	1	36%	38%	35%	43%	-2%	6%
	2	38%	45%	42%	46%	4%	1%
	3	43%	54%	41%	49%	-1%	-5%
	4	41%	58%	50%	55%	8%	-3%
	5	52%	66%	41%	59%	-12%*	-6%
10-11	1	26%	31%	35%	36%	8%*	4%
	2	35%	30%	31%	36%	-4%	6%
	3	36%	39%	37%	41%	1%	2%
	4	37%	38%	42%	50%	4%	12%*
	5	48%	48%	35%	50%	-13%*	2%
12-13	1	19%	21%	27%	26%	8%*	5%
	2	17%	35%	24%	42%	6%	7%
	3	30%	31%	27%	45%	-3%	14%*
	4	29%	32%	32%	47%	4%	14%*
	5	34%	40%	36%	48%	2%	8%
14-15	1	10%	17%	20%	28%	10%*	11%*
	2	21%	19%	21%	36%	-1%	17%*
	3	21%	32%	34%	35%	13%*	3%
	4	21%	26%	29%	47%	9%*	21%*
	5	25%	40%	22%	45%	-3%	5%
16-17	1	6%	9%	13%	22%	7%	14%*
	2	8%	16%	19%	19%	11%*	3%
	3	16%	14%	19%	28%	3%	14%*
	4	9%	18%	24%	32%	16%*	14%*
	5	19%	**22%**	24%	**39%**	5%	17%*
18-19	1	0%	0%	1%	12%	1%	12%
	2	0%	0%	0%	1%	0%	1%
	3	2%	0%	3%	4%	1%	4%
	4	0%	0%	7%	5%	7%	5%
	5	1%	12%	2%	1%	2%	11%
Total		**37%**	**45%**	**44%**	**53%**	**7%***	**9%**

* Difference between 2001 and 2007/8 is statistically significant at the 5 percent level.

Table 3: Summary statistics of the variable included in the Heckman probit model, rural Zimbabwe 2001 and 2007/8

	2001		2007	
Variables	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**
Enrollment	0.748	0.434	0.740	0.439
Age-appropriate grade	0.305	0.461	0.359	0.480
Asset index:				
Quintile 1	0.186	0.389	0.217	0.412
Quintile 2	0.216	0.412	0.201	0.400
Quintile 3	0.206	0.404	0.231	0.421
Quintile 4	0.211	0.408	0.148	0.355
Quintile 5	0.182	0.386	0.203	0.403
Child's characteristics:				
Gender dummy	0.508	0.500	0.516	0.500
Age	12.241	3.974	11.937	4.113
Province:*				
Manicaland	0.237	0.425	0.164	0.371
Mashonaland Central	0.111	0.314	0.116	0.320
Mashonaland East	0.123	0.328	0.135	0.341
Mashonaland West	0.101	0.301	0.115	0.320
Matabeleland North	0.068	0.252	0.089	0.284
Matabeleland South	0.077	0.266	0.076	0.265
Midlands	0.141	0.348	0.141	0.348
Masvingo	0.143	0.350	0.165	0.371
Head's characteristics:				
Head's gender	0.564	0.496	0.599	0.490
Head's age	48.424	14.695	48.813	15.685
Head's education:				
No education	0.175	0.380	0.166	0.372
Primary education	0.628	0.483	0.522	0.500
Secondary education	0.170	0.376	0.292	0.455
Post-secondary education	0.028	0.164	0.021	0.142
Head's main economic activity				
Permanent paid employee	0.121	0.326	0.074	0.262
Head is a temporary employee	0.030	0.171	0.034	0.182
Communal/resettlement work	0.780	0.414	0.839	0.368

Own-account worker	0.033	0.178	0.024	0.152
Other activities	0.037	0.188	0.030	0.169
Household composition:				
Nb of children aged between 6-19	3.411	1.674	3.236	1.642
Nb of adults	1.887	1.048	2.060	1.192
Nb of elderly	0.208	0.473	0.235	0.498
Nb of children aged between 0-5	0.949	0.982	0.895	0.942
School accessibility:				
Distance to primary school	2.789	2.310	3.077	2.357
Distance to secondary school	5.808	4.933	5.527	5.016
Distance to bus stop	2.644	7.010	4.920	23.059
Dummy for age to enter grade 1	0.070	0.255	0.072	0.259
Land use area:				
CA	0.791	0.003	0.840	0.002
SSCF	0.035	0.001	0.006	0.001
LSCF	0.105	0.002	0.076	0.002
RA	0.068	0.002	0.079	0.002
Number of observations:	23541		21650	

* While provincial dummies are important to explain schooling outcomes, their coefficients are not included in the tables below for space preservation purpose.

Table 4: Marginal effects on the probability of being enrolled in school and being in age-appropriate grade, conditional on school participation, rural Zimbabwe 2001

	School attendance			Correct Grade		
Variables	**dy/dx**	**Std. Err.**	**P>z**	**dy/dx**	**Std. Err.**	**P>z**
Asset quintile: Base quintile 1						
Quintile 2	0.032	0.008	0.000	0.045	0.010	0.000
Quintile 3	0.054	0.008	0.000	0.084	0.010	0.000
Quintile 4	0.072	0.009	0.000	0.082	0.011	0.000
Quintile 5	0.069	0.010	0.000	0.146	0.014	0.000
Child's gender	0.029	0.005	0.000	-0.046	0.007	0.000
Child's age	-0.052	0.001	0.000	-0.068	0.001	0.000
Head's gender	-0.015	0.006	0.015	-0.040	0.008	0.000
Head's age	0.001	0.000	0.022	0.001	0.000	0.004
Head education: Base No education						
Head has primary education	0.055	0.008	0.000	0.049	0.010	0.000
Head has secondary education	0.078	0.011	0.000	0.088	0.014	0.000
Head has post-secondary education	0.054	0.021	0.010	0.116	0.031	0.000
Head sector of employment: Base Permanent paid employee						
Temporary employee	-0.029	0.017	0.085	-0.073	0.023	0.001
Communal/resettlement work	0.009	0.013	0.504	-0.032	0.019	0.095
Own-account worker	0.000	0.019	0.997	-0.031	0.025	0.226
Other activities	0.053	0.019	0.005	0.032	0.029	0.279
Nb of children aged between 6-19	-0.001	0.002	0.465	-0.002	0.002	0.410
Nb of adults	0.005	0.003	0.118	-0.002	0.004	0.588
Nb of elderly	0.003	0.008	0.709	0.010	0.011	0.351
Nb of children aged between 0-5	-0.014	0.003	0.000	-0.009	0.004	0.034
Distance to primary school	-0.006	0.001	0.000	-0.003	0.002	0.082
Distance to secondary school	-0.005	0.001	0.000	-0.002	0.001	0.027
Distance to bus stop	0.000	0.001	0.800	0.000	0.001	0.897
Land use area: Base CA						
SSCF	0.037	0.014	0.008	0.003	0.020	0.881
LSCF	-0.076	0.016	0.000	-0.093	0.017	0.000
RA	-0.006	0.011	0.557	-0.007	0.015	0.642

Table 5: Marginal effects on the probability of being enrolled in school and being in age-appropriate grade, conditional on school participation, rural Zimbabwe 2007

	School attendance			Correct Grade		
Variables	**dy/dx**	**Std. Err.**	**P>z**	**dy/dx**	**Std. Err.**	**P>z**
Asset quintile: Base quintile 1						
Quintile 2	0.043	0.009	0.000	0.033	0.011	0.003
Quintile 3	0.047	0.009	0.000	0.057	0.011	0.000
Quintile 4	0.065	0.010	0.000	0.089	0.012	0.000
Quintile 5	0.091	0.011	0.000	0.085	0.014	0.000
Child's gender	-0.004	0.006	0.434	-0.072	0.008	0.000
Child's age	-0.050	0.001	0.000	-0.061	0.001	0.000
Head's gender	-0.035	0.006	0.000	-0.023	0.008	0.007
Head's age	0.001	0.000	0.000	0.001	0.000	0.000
Head education: Base No education						
Head has primary education	0.072	0.010	0.000	0.021	0.011	0.058
Head has secondary education	0.131	0.011	0.000	0.102	0.014	0.000
Head has post-secondary education	0.164	0.024	0.000	0.103	0.035	0.003
Head sector of employment: Base Permanent paid employee						
Temporary employee	-0.015	0.027	0.565	-0.050	0.031	0.099
Communal/resettlement work	0.063	0.016	0.000	-0.005	0.020	0.814
Own-account worker	-0.008	0.028	0.774	-0.045	0.030	0.126
Other activities	0.086	0.022	0.000	-0.020	0.027	0.455
Nb of children aged between 6-19	-0.003	0.002	0.077	-0.007	0.002	0.006
Nb of adults	0.011	0.003	0.000	0.000	0.004	0.952
Nb of elderly	-0.009	0.008	0.304	-0.018	0.010	0.090
Nb of children aged between 0-5	-0.012	0.003	0.000	-0.021	0.004	0.000
Distance to primary school	-0.004	0.002	0.021	-0.004	0.002	0.068
Distance to secondary school	-0.007	0.001	0.000	-0.006	0.001	0.000
Distance to bus stop	0.000	0.000	0.807	0.000	0.000	0.744
Dummy for age to enter grade 1	-0.197	0.014	0.000	-0.103	0.010	0.000
Land use area: Base CA						
SSCF	-0.095	0.047	0.044	-0.162	0.046	0.000
LSCF	-0.008	0.012	0.530	-0.019	0.016	0.245
RA	-0.029	0.011	0.009	-0.041	0.013	0.002

Table 6: Marginal effects on the probability of being enrolled in school and being in age-appropriate grade, conditional on school participation, *for boys*, rural Zimbabwe 2001

	School attendance			Correct Grade		
Variables	**dy/dx**	**Std. Err.**	**P>z**	**dy/dx**	**Std. Err.**	**P>z**
Asset quintile: Base quintile 1						
Quintile 2	0.034	0.012	0.005	0.035	0.013	0.007
Quintile 3	0.049	0.012	0.000	0.069	0.013	0.000
Quintile 4	0.078	0.012	0.000	0.058	0.014	0.000
Quintile 5	0.052	0.014	0.000	0.106	0.017	0.000
Child's age	-0.048	0.001	0.000	-0.055	0.001	0.000
Head's gender	-0.031	0.009	0.001	-0.040	0.011	0.000
Head's age	0.001	0.000	0.178	0.000	0.000	0.695
Head education: Base No education						
Head has primary education	0.072	0.011	0.000	0.050	0.012	0.000
Head has secondary education	0.101	0.015	0.000	0.077	0.018	0.000
Head has post-secondary education	0.117	0.036	0.001	0.105	0.038	0.006
Head sector of employment: Base Permanent paid employee						
Temporary employee	-0.008	0.026	0.767	-0.079	0.028	0.004
Communal/resettlement work	-0.007	0.022	0.750	-0.018	0.023	0.431
Own-account worker	-0.038	0.031	0.215	0.005	0.034	0.885
Other activities	0.072	0.027	0.008	0.016	0.036	0.646
Nb of children aged between 6-19	-0.004	0.002	0.124	-0.003	0.003	0.335
Nb of adults	0.009	0.005	0.053	-0.002	0.005	0.745
Nb of elderly	-0.012	0.011	0.270	0.029	0.013	0.031
Nb of children aged between 0-5	-0.013	0.004	0.001	-0.007	0.005	0.178
Distance to primary school	-0.007	0.002	0.002	0.000	0.003	0.856
Distance to secondary school	-0.006	0.001	0.000	-0.005	0.002	0.003
Distance to bus stop	-0.002	0.002	0.195	0.000	0.002	0.839
Dummy for age to enter grade 1	-0.328	0.023	0.000	0.076	0.005	0.000
Land use area: Base CA						
SSCF	0.051	0.021	0.018	0.015	0.026	0.572
LSCF	-0.053	0.026	0.038	-0.031	0.023	0.179
RA	0.014	0.015	0.369	0.028	0.020	0.145

Table 7: Marginal effects on the probability of being enrolled in school and being in age-appropriate grade, conditional on school participation, *for girls*, Rural Zimbabwe 2001

	School attendance			Correct Grade		
Variables	**dy/dx**	**Std. Err.**	**P>z**	**dy/dx**	**Std. Err.**	**P>z**
Asset quintile: Base quintile 1						
Quintile 2	0.027	0.011	0.016	0.051	0.014	0.000
Quintile 3	0.057	0.012	0.000	0.094	0.015	0.000
Quintile 4	0.067	0.013	0.000	0.100	0.016	0.000
Quintile 5	0.085	0.014	0.000	0.180	0.021	0.000
Child's age	-0.053	0.001	0.000	-0.068	0.001	0.000
Head's gender	-0.009	0.008	0.277	-0.034	0.012	0.006
Head's age	0.001	0.000	0.126	0.002	0.001	0.000
Head education: Base No education						
Head has primary education	0.044	0.010	0.000	0.049	0.014	0.001
Head has secondary education	0.062	0.015	0.000	0.092	0.021	0.000
Head has post-secondary education	0.035	0.026	0.177	0.122	0.048	0.011
Head sector of employment: Base Permanent paid employee						
Temporary employee	-0.043	0.022	0.052	-0.067	0.035	0.055
Communal/resettlement work	0.025	0.018	0.149	-0.046	0.030	0.125
Own-account worker	0.027	0.024	0.251	-0.075	0.038	0.047
Other activities	0.032	0.028	0.253	0.033	0.046	0.473
Nb of children aged between 6-19	0.000	0.002	0.841	-0.001	0.003	0.712
Nb of adults	0.004	0.004	0.263	-0.003	0.006	0.655
Nb of elderly	0.020	0.011	0.073	-0.015	0.016	0.372
Nb of children aged between 0-5	-0.014	0.004	0.000	-0.007	0.006	0.276
Distance to primary school	-0.004	0.002	0.021	-0.006	0.003	0.056
Distance to secondary school	-0.005	0.001	0.000	-0.001	0.002	0.716
Distance to bus stop	0.001	0.001	0.483	-0.006	0.002	0.017
Dummy for age to enter grade 1	-0.235	0.017	0.000	-0.128	0.015	0.000
Land use area: Base CA						
SSCF	0.038	0.018	0.031	0.006	0.030	0.837
LSCF	-0.086	0.021	0.000	-0.150	0.025	0.000
RA	-0.016	0.015	0.263	-0.043	0.021	0.040

Table 8: Marginal effects on the probability of being enrolled in school and being in age-appropriate grade, conditional on school participation, *for boys*, rural Zimbabwe 2007/8

	School attendance			Correct Grade		
Variables	**dy/dx**	**Std. Err.**	**P>z**	**dy/dx**	**Std. Err.**	**P>z**
Asset quintile: Base quintile 1						
Quintile 2	0.046	0.014	0.001	0.022	0.015	0.142
Quintile 3	0.042	0.014	0.002	0.045	0.015	0.003
Quintile 4	0.063	0.014	0.000	0.072	0.017	0.000
Quintile 5	0.109	0.015	0.000	0.052	0.019	0.005
Child's age	-0.048	0.001	0.000	-0.060	0.002	0.000
Head's gender	-0.042	0.009	0.000	-0.035	0.011	0.002
Head's age	0.001	0.000	0.088	0.002	0.000	0.000
Head education: Base No education						
Head has primary education	0.082	0.014	0.000	0.029	0.015	0.052
Head has secondary education	0.138	0.017	0.000	0.108	0.020	0.000
Head has post-secondary education	0.173	0.039	0.000	0.089	0.046	0.053
Head sector of employment: Base Permanent paid employee						
Temporary employee	-0.058	0.040	0.141	-0.064	0.041	0.124
Communal/resettlement work	0.042	0.024	0.080	-0.034	0.028	0.228
Own-account worker	-0.013	0.040	0.753	-0.073	0.042	0.082
Other activities	0.085	0.031	0.007	-0.024	0.039	0.543
Nb of children aged between 6-19	-0.007	0.003	0.018	-0.007	0.003	0.025
Nb of adults	0.019	0.004	0.000	-0.005	0.005	0.341
Nb of elderly	0.002	0.013	0.845	-0.033	0.014	0.018
Nb of children aged between 0-5	-0.012	0.005	0.019	-0.016	0.006	0.006
Distance to primary school	-0.007	0.002	0.005	-0.003	0.003	0.234
Distance to secondary school	-0.007	0.001	0.000	-0.005	0.002	0.001
Distance to bus stop	0.000	0.000	0.917	0.000	0.001	0.404
Dummy for age to enter grade 1	-0.260	0.033	0.000	-0.061	0.028	0.027
Land use area: Base CA						
SSCF	-0.071	0.060	0.235	-0.180	0.057	0.001
LSCF	-0.018	0.018	0.313	-0.030	0.022	0.172
RA	-0.033	0.016	0.039	-0.053	0.018	0.003

Table 9: Marginal effects on the probability of being enrolled in school and being in age-appropriate grade, conditional on school participation, *for girls*, rural Zimbabwe 2007/8

	School attendance			Correct Grade		
Variables	**dy/dx**	**Std. Err.**	**P>z**	**dy/dx**	**Std. Err.**	**P>z**
Asset quintile: Base quintile 1						
Quintile 2	0.039	0.012	0.001	0.043	0.016	0.008
Quintile 3	0.050	0.012	0.000	0.068	0.016	0.000
Quintile 4	0.067	0.013	0.000	0.105	0.018	0.000
Quintile 5	0.072	0.014	0.000	0.117	0.021	0.000
Child's age	-0.051	0.001	0.000	-0.062	0.002	0.000
Head's gender	-0.032	0.008	0.000	-0.014	0.012	0.263
Head's age	0.002	0.000	0.000	0.001	0.001	0.097
Head education: Base No education						
Head has primary education	0.060	0.013	0.000	0.009	0.016	0.588
Head has secondary education	0.123	0.015	0.000	0.088	0.021	0.000
Head has post-secondary education	0.154	0.028	0.000	0.116	0.051	0.022
Head sector of employment: Base Permanent paid employee						
Temporary employee	0.013	0.034	0.690	-0.048	0.041	0.240
Communal/resettlement work	0.068	0.022	0.002	0.015	0.028	0.580
Own-account worker	-0.013	0.037	0.724	-0.027	0.041	0.513
Other activities	0.067	0.031	0.030	-0.022	0.039	0.574
Nb of children aged between 6-19	0.000	0.002	0.982	-0.006	0.004	0.089
Nb of adults	0.002	0.004	0.502	0.005	0.006	0.355
Nb of elderly	-0.024	0.010	0.019	0.000	0.016	0.978
Nb of children aged between 0-5	-0.009	0.004	0.026	-0.025	0.006	0.000
Distance to primary school	-0.001	0.002	0.664	-0.004	0.003	0.208
Distance to secondary school	-0.007	0.001	0.000	-0.007	0.002	0.001
Distance to bus stop	0.000	0.000	0.709	0.001	0.001	0.230
Dummy for age to enter grade 1	-0.152	0.017	0.000	-0.100	0.013	0.000
Land use area: Base CA						
SSCF	-0.099	0.076	0.196	-0.113	0.078	0.148
LSCF	0.003	0.016	0.839	-0.004	0.024	0.880
RA	-0.031	0.014	0.033	-0.030	0.019	0.114

Table 10: Marginal effects on the probability of being enrolled in school and being in age-appropriate grade, conditional on school participation, Rural Zimbabwe 2001

	School attendance			Correct Grade		
Variables	**dy/dx**	**Std. Err.**	**P>z**	**dy/dx**	**Std. Err.**	**P>z**
Per capita consumption expenditures: Base quintile 1						
Quintile 2	0.035	0.008	0.000	0.041	0.009	0.000
Quintile 3	0.043	0.008	0.000	0.066	0.010	0.000
Quintile 4	0.044	0.008	0.000	0.082	0.012	0.000
Quintile 5	0.038	0.010	0.000	0.108	0.015	0.000
Child's gender	0.029	0.005	0.000	-0.045	0.007	0.000
Child's age	-0.052	0.001	0.000	-0.068	0.001	0.000
Head's gender	-0.017	0.006	0.005	-0.043	0.008	0.000
Head's age	0.001	0.000	0.021	0.001	0.000	0.004
Head education: Base No education						
Head has primary education	0.063	0.008	0.000	0.060	0.010	0.000
Head has secondary education	0.088	0.011	0.000	0.102	0.014	0.000
Head has post-secondary education	0.068	0.021	0.001	0.134	0.031	0.000
Head sector of employment: Base Permanent paid employee						
Temporary employee	-0.029	0.016	0.073	-0.084	0.023	0.000
Communal/resettlement work	0.003	0.013	0.838	-0.044	0.019	0.020
Own-account worker	-0.005	0.018	0.796	-0.035	0.026	0.174
Other activities	0.046	0.018	0.012	0.024	0.029	0.419
Nb of children aged between 6-19	0.002	0.002	0.260	0.005	0.002	0.018
Nb of adults	0.008	0.003	0.009	0.003	0.004	0.494
Nb of elderly	0.008	0.008	0.281	0.023	0.011	0.039
Nb of children aged between 0-5	-0.012	0.003	0.000	-0.004	0.004	0.289
Distance to primary school	-0.006	0.001	0.000	-0.005	0.002	0.019
Distance to secondary school	-0.006	0.001	0.000	-0.003	0.001	0.005
Distance to bus stop	0.000	0.001	0.914	-0.001	0.001	0.472
Dummy for age to enter grade 1	-0.259	0.014	0.000	-0.131	0.013	0.000
Land use area: Base CA						
SSCF	0.037	0.013	0.005	0.008	0.020	0.701
LSCF	-0.058	0.015	0.000	-0.065	0.018	0.000
RA	0.003	0.010	0.800	0.011	0.015	0.470