The Determinants of Primary Education Dropout in Malawi

By

Jeena Kim

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Committee in Charge :

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ABSTRACT

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Education is considered a significant tool of reducing poverty and of promoting the standard of living of an individual, a household and, by extension, a society where one belongs to. In Malawi, since the government abolished the school fees in 1995, the enrollment rate at primary level sharply went up but soon after, not many students have survived to the completion of school. This paper investigates the determinants of dropout at the primary education level with socioeconomic factors given free education program. Using Malawian integrated household survey conducted between 2010 and 2011, logistic model analysis is adopted. It will present evidence that socioeconomic factors such as parents' educational achievement and household wealth influence the chance of pupils dropping out of school. Among the factors, pregnancy has a significant impact on girls while higher number of siblings improves the prospects for success in completing primary school. Children are more likely to leave the school when the oldest sibling has dropped out before completion of primary school.

Key words: primary school dropout, education, gender, logistic analysi

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I. INTRODUCTION

As UN has embarked on Millennium Development Goals in 2000 the global society stressed the importance of the primary education achievement as a way of eradicating poverty. The main focused region of the goals is especially sub-Saharan Africa where the least developed countries (LDCs) are gathered. Malawi, one of LDCs, started Free Primary Education program to keep pace with the spread of compulsory schooling movement. The enrollment rate has jumped dramatically since FPE implemented and the program appeared to be effective. Soon after, however, attendance rate has shown inconsistent and dropout rate has increased (UNESCO 2011). The record shows that completion rate reaches only 45.8%, which is lower than sub-Saharan African average of 66.9% (UNESCO 2009).

It is needed to determine which factors affect an individual's decision to stay in school if certain characteristics play a part. Although empirical studies focusing on determinants of primary schooling have been done before, few studies of Malawian case have been undertaken on the issue. In this study, the latest (2010-2011) dataset of a household- and district-level survey is used to find out the effects on primary school dropout. This paper has two main objectives. First, it examines the determinants influencing a pupil's decision to leave school at primary educational level. Second, it explores policy alternatives to curb dropout that can be pursed.

Research questions

1. *What are the factors affecting primary school dropout given free education in Malawi?*
2. *What alternative policy can be recommended to reduce dropout of pupils?*

In the survey, 15,722 children (7,822 boys and 7,900 girls, aged 6-18), living in 31 districts in Malawi are included. The more detailed information on the data can be found in data description and methodology part. To estimate the effects of factors, the logistic regression models will be applied

This paper consists of five sections. The first section will discuss the country background and the structure of education in Malawi. The literature review on similar studies and a number of hypotheses will be formulated, utilizing individual- , household-, and school-level variables in the section 2. This is followed by the data and methodology explanation in section 3, which will present the description of variables for logistic regression along with the conceptual framework. Next, the paper will analyze the findings of result in section 4 and suggest the policy recommendation in section 5.

1.1 Country Backgrounds

Malawi is located in the southeastern Africa surrounded by Tanzania, Zambia, and Mozambique with the total population of 15.38 million (in 2011). 85% of population live in rural area, and 45% are aged between 0-14. A GNI per capita is $360(2011), ranking 211 out of 215 countries.[1] Malawi is one of the Least Developed Countries(LCDs) where 50.7% live under the national poverty line. The economic growth is expected to be less than 3%, much below Africa's projected growth average of 4.8% seemingly due to deteriorated policy environment[2]. After Malawi gained independence from Britain in 1964, Dr. Hastings K. Banda took power and consolidated his dictatorial government for 30 years. In 1990s, as the objection against Banda's repressive rule became more violent and

[1] The information can be found at *http://siteresources.worldbank.org/DATASTATISTICS/Resources/GNIPC.pdf*

[2] The information can be found at *http://www.worldbank.org/en/country/malawi/overview*

aid from Western countries shrank, Banda faced fierce protests. More than 80% of voters participated in the first free election in 1993 to cast their votes for new political system, and Bakili Muluzi of United Democratic Front (UDF) was elected as a president. Since then, however, the Malawian government has been struggling to deal with serious national issues such as inflation, financial difficulties, growing unemployment, undernourishment, crime. Specially, in 2002 and 2003, more than 3 million people had to suffer from severe food shortages, and more than 4 million people which is 34% of population ran short of food supplies in 2005. Malawi's economy is characterized by subsistence agriculture, cultivation of tobacco and tea for export, and fishing industry around Lake Malawi. Although the size has been reduced, Malawi has a high level of dependence on foreign aid. Only a third of the land is suited to farming. Malawi's health index has been lately improved, but due to the challenges in distribution and delivery of medical services, the differences between urban and rural areas are exhibited especially in infant and child mortality. Gender equality is mandated by the constitution and legislation. Nonetheless, Malawi ranked 120 among 187 countries in a Human Development Index by UN Human Development Report 2011 indicating that women are treated differently in many social aspects. Regarding wage employment, while 18% of male are engaged in gainful employment, only 10% of female are gainfully employed. The gap between men and women also exists in the average median wage.[3]

The detailed statistics indicating Malawi's basic background can be viewed in Table 1.

[3] See African Economic Outlook *http://www.africaneconomicoutlook.org/en/countries/southern-africa/malawi*

Table 1. Country Characteristics

General Information	
Region	Sub-Saharan Africa
Area (km^2)	118,484
Population, 2011	15.38 million
Population growth rate, 2011(%)	2.75
Life expectancy, 2012	55
Under-5 Infant mortality rate, 2011	82.6
Rural population, 2011 (%)	85
Population 0-14 years (%)	45
Type of economy	Low income
Poverty(% of pop under the poverty line)	50.7
GDP per capita, 2011 ($US)	365
Education Indicators	
Duration for compulsory education	8 years
Public expenditure per student, primary, 2011 (% of GDP per capita)	8.28
Adult literacy rate, 2011	74
Pupil-Teacher ratio at primary school, 2011	76
Persistence to grade 5, 2011 (%)	59

[Resource: World Bank databank 2011]

1.2. Education System in Malawi

The education structure in Malawi is followed 8-4-4 year system. The primary school is comprised of three parts - infant(Std 1 & 2), junior(Std 3 & 4), and senior(Std 5, 6, 7 & 8). After Std 8, students take the Primary School Leaving Certificate Examinations(PSLC) to get permission to be admitted into the secondary level which is divided into two section with two respective years. After completing the secondary school, students also have to undergo the Junior Certificate Examinations(JCE) to move on to the tertiary school with the duration of four years(Masperi and Hollow2008, 16).

The Malawian government implemented a Free Primary Education policy in the early 1990s, which shifted its focus on from secondary and tertiary to primary education. The

educational policy placed emphasis on post primary level because the main objective of education was formed with a program of ‘progressive localization’ (Malawi Government 1966) which aimed to replace the colonial government official posts with new professionals and elites. After independence, however, as the importance of universal primary education was acknowledged, the Malawian government emphasized the primary education in order to improve equity and increase access to school. In 1994, the new elected government implemented Free Primary Education (FPE), followed by a surge of enrollment (Kadzamira and Rose 2003). Despite high enrollment rate, not many students survived to completion of primary level and dropped out of school or repeated in the same class for a long time. Differences still persist with regard to male and female pupils (Kadzamira and Rose 2001). Therefore, it is meaningful to define what factors made children leave the school in Malawi and develop alternative policies that curb dropout rate.

II. LITERATURE REVIEW

2.1 Child Characteristics

The literature states that the age and gender of a child are important factors of child's decision to stay in school (Assaad, Levision, and Zibani 2010). Older child has higher probability of a dropping out of school and is less likely to have longer years than younger child. Dropout rates are higher for girls than for boys because households and communities put different value on girls' and boy's education, i.e. men are considered breadwinners not only of his own family but also of his parents in their old age whereas women usually support her family as wife and mother whose role is regarded to have less importance to receive education (Woldehanna, Jones, and Tefera, 2006). Also, Odaga and Heneveld(1995) said that parents are worried to waste their money on education of girls and discouraged to send their girls to school as the child no longer belongs to their family but to her husband's family once girls are married or pregnant. Since we split the students into two groups according to gender, variable of age only is included into the model. Students living with both parents have lower likelihood to quit school, compared to students whose parent is dead. It may be because pupils have to take on family affair or work that would be carried out by a missing parent otherwise (Husiman and Smits, 2008; Rumberger and Lim 2008). In a situation where children need to do extra household chores or contribute to household income, parents are inclined to place a burden on adopted or foster children rather than their own children. Thus, we include a variable of whether a child is biological or not expecting biological children are more likely to stay in school (Fafchamps and Wahga, 2006).

2.2 Household Head Characteristics

The age of household head is one of the important and negative predictors of dropping out. This signifies that the role of parental decision influences children leaving school. Older household head tends to feel keenly the necessity of education especially for younger children as children make their own decision when they get older (Mike, Nakajjo, and Isoke). Mabika and Shapiro said that the sex of the household head influences pupil's decision to complete the school. Children, especially girls have a stronger tendency to remain in school when the household is female. There are ample empirical studies that parental educational achievements increase the probability of schooling for their children (Grootaert 1998; Grootaert & Kanbur 1999; Bhalotra & Heady 2003; Tzannatos 2003). Among the parents, the educational level of mothers would have stronger effect on the schooling especially for girls (Gönsch 2010).

2.3 Household Characteristics

The number of siblings is an important influence on educational dropout. In some developing countries, the more siblings in a family, the high dropout rate represents. The reason for this may be that constraint resources for education are to be shared among many brothers and sisters (Buchmann & Hannum 2001; Pong 1997). There are, however, some cases opposite to this situation. For instance, in rural Botswana, children aged from 7 to 14 stay in school at a high rate because they have many siblings who help household affairs and they can save work time and go to school (Chernichovski 1985). Families with higher socio-economic status have a less probability to drive their children out of school. This is due to the fact that wealthier family may find less burdensome the

direct cost such as school fees, textbooks, and uniforms and also opportunity cost of children helping the household work or brining additional income to the family(Edmonds 2006; Ersado 2005; Thorbecke & Charumilind 2002). Since like other developing countries, income is insufficient in the survey, we use alternative proxy for household wealth. We selected three durable goods to discriminate household wealth as wealth index. Students whose older siblings have been dropped out are more likely to leave school (Rumberger and Lim 2008). This also implies that the family has been historically marginalized, and we include a predictor of whether the oldest child has dropped out of school or not. Changes in family structure in company with events that decrease the household welfare such as illness, death, marital disruption, and natural disaster also may have a positive impact on children dropping out of school (Rumberger and Lim, 2008; Woldehanna, Jones, and Tefera, 2006).

2.4 Community Characteristics

An indicator of urbanization needs to be considered as well. In urban area, the infrastructure such as transportation and road is mostly better to enhance the access to the school, and the government's influence is generally stronger (Fafchaps & Wahba 2006). The educational facilities that each community embraces have a great impact on primary school dropout. The quantity of education can be measured with the distance to the school. According to Colclough et al., children who live far from the school are less likely to attend class (Colclough et al. 2000). That seems because parents are afraid of dangers which might be faced by their children on the way to school, or children feel physically hard to commute long distance. The quality education is usually presented by the Pupil-

Teacher Ratio, which shows how many students are taught by each teacher (UNESCO 2004). School feeding programs may have effect on reducing dropout rate (Adrogue and Orlicki).

III. DATA AND RESEARCH METHOD

3.1 Conceptual Framework

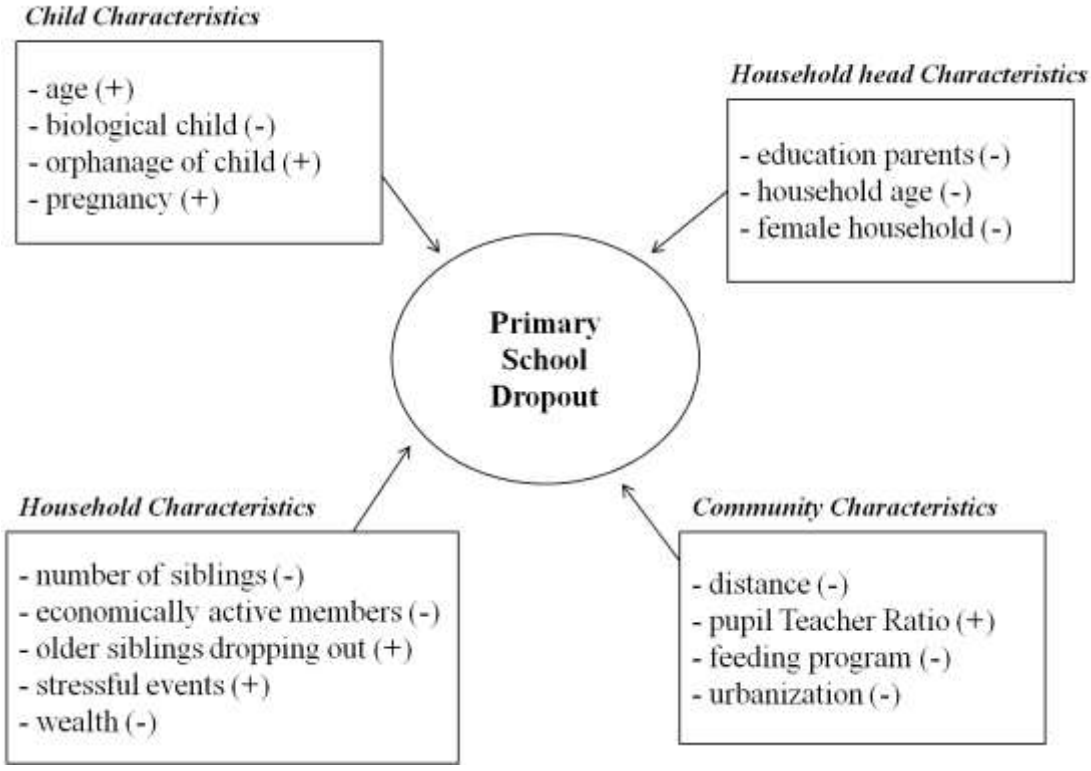
According to the human capital theory, education is seen as returns on investment later in one's life (Becker 1962; Mincer 1958). Therefore, in the decision making process expected benefits and costs function is included for consideration.

The factors of dropout directly influence pupils' decision to abandon completion of primary school or parents' determination to withdraw their children from school. Other variables indirectly affect their decision to quit school. If a value or benefits of schooling is not well known for a certain group, what factors affect the decision of dropout can be defined in different aspects. The schooling can be summarized with a comparison of benefits and costs (see e.g. Guimbert et al 2008; Mike, Nakajjo, and Isoke).

$$D = f (S, C, H, R)$$

In this equation, D represents dropout, S means a vector of student characteristics, C is a vector of school characteristics, H shows a vector of household characteristics, and R is a vector of household head characteristics (Mike, Nakajjo, and Isoke). The diagrammatic exposition is as presented in figure 1.

Figure 1. Theoretical model of dropout



[Resource: Huisman and Smits, revised by writer]

3.2 Data

To test the hypotheses, the representative household datasets from the Third Integrated Household Survey 2010-2011 are used. The survey was conducted by National Statistical Office(NSO) from the Ministry of Economic Planning and Development(MoEPD), including World Bank as technical assistance, covering three major regions of Malawi: North, Center, and South. The urban areas are Lilongwe City, Blantyre City, Mzuzu City, and the Municipality of Zomba, and the remaining 27 districts are considered as rural areas. The island district of Likoma is excluded in the survey because it only represents about 0.1% of the population of Malawi. Therefore, 31 districts are included overall in

the IHS3. 768 communities and 12271 households were sampled and among them, 15,722 children (7,822 boys and 7,900 girls, aged 6-18) are selected except variables with missing values. The reason why we chose children in age group 6-18 is to capture the effect of students even who entered the school late or repeated the same class of primary education. To see the different effects of gender, the analyses are carried out respectively for boys and girls. The Appendix A contains detailed information on the structure of the sampling of household and community.

3.3 Empirical Strategy

Since the dichotomous nature of the dependent variable, the paper uses logistic regression analyses with log odds ratio to identify key determinants of dropout at primary school. This estimates the probability of the dependent variable to be 1(Y=1), which means children dropping out of school. Odds ratio indicates the odds of Y=1 when X increases by 1 unit(Torres-Reyna 2007). The formula reads:

$$Pr(Y=1|X1, X2,\ldots.X_k) = F(\beta_0 + \beta_1 X1 + \beta_2 X2 + \ldots + \beta_k X_k)$$

$$Pr(Y=1|X1, X2,\ldots.X_k) = \frac{1}{1+e^{-(\beta_0+\beta_1 X1+\beta_2 X2+..+\beta_k X_k)}}$$

Where $\beta_1 \ldots \beta_k$ are the natural log of the odds of the independent variables, and $X1 \ldots X_k$ denotes the individual, household head, household, and community specific factors that have associations with dropout.

3.4 Explanatory variables

To see the different effects on girls and boys respectively, the analysis are separately implemented by gender. The dependent variable y is binary, assuming only two values that for convenience coded as 1 or 0. The definition y is;

y = 1 if a child aged 6-18 was reported to drop out of school before reaching primary completion

0 else

The reason of including age from 6 to 18 is to find out the effects of pupils who entered school late or repeatedly stay in the same class.

Characteristics of Child

Regarding the independent variables, age of the child is measured in years as continuous variable. Orphanage of a child is considered two dummies: (0) or not, (1) either mother or father is dead. Pregnancy is expressed in dummy variable: (0) or not, (1) gave a birth in the past 24 month, and own child is in a dummy: (0) or not, (1) biological child.

Household head Characteristics

The age household head is measured in years as a continuous variable and the gender of household is captured as: (0) male and (2) female. Parental education level is measured in number of years of schooling as continuous variables. We give children with a missing parent the mean score of other pupils in the dataset on the variables for educational level. Since dummies for died parent are included, the procedure brings about unbiased estimation on these variables.

Household Characteristics

Because of lack of exact information on income, the approximate household wealth is captured by proxy variables – if a household posses (0) or not (1) bicycle; (0) or not (1) radio; (0) or not (1) bed. The number of siblings and the number of events that decrease household wealth are measured as continuous variables. Proportion of economically active members is measured in the number of persons aged between 18 and 64 in a household divided by the total members in the household.

Community Characteristics

Urbanization is captured with dummies: (0) rural (1). To measure the quantity and quality of educational facilities at the community level, two indicators are used. First, the distance to the public primary school serving each community is calculated with a measure of kilometer. For the quality of education, Pupil-Teacher Ratio is used. Because of the absence of information about the whole primary schools in communities, the data on the nearest government primary school is utilized. Also, to see the effect of feeding program, a dummy for existence of the program is measured as: (0) or not, (1) the school has a feeding program.

The independent variables used in the model are summarized in Table 2.

Table 2.Variables in the model

VARIABLES Name		Label
Child characteristic		
age		
biological_child		The child is biological.
orphanage of a child	*Father dead*	Father of a child died.
	Mother dead	Mother of a child died.
Pregnant		The pupil has given birth in the past 24 month.
Household head characteristic		
father_education		The number of years of schooling for fathers.
mother_education		The number of years of schooling for mothers.
hh_age		Household head age.
female_hh		Household head is female.
Household characteristics		
number_siblings		The number of siblings in a household.
pro_eco_members		Proportion of members involving in economic activities.
oldest_history		The oldest has dropped out before primary completion.
event_number		Number of events that decreases the HH welfare.
bed		Household owns at least one bed.
bicycle		Household owns at least one bicycle.
radio		Household owns at least one radio.
Community factors		
urban		Living in an urban area.
distance		Distance to the nearest public school (km).
pt_ratio		Pupil Teacher Ratio.
feeding_pro		School offers feeding program.

V. RESULTS

5 .1 Descriptive Analysis

The data description is summarized with frequencies for categorical variables and means for continuous variables in the database.

Frequency of Categorical variables

Factor	Categories	Frequency	Percent
Rural/Urban divide	Urban	2,550	16.22
	Rural	13,172	83.78
Gender of household head	Male	12,067	76.75
	Female	3,655	23.25
Gender of Pupil	Male	7,822	49.75
	Female	7,900	50.25
Orphanage of Pupil	Mother died	1,023	6.51
	Father died	2,042	12.99
Biological child	Biological child	12,646	80.44
	Adopted/foster child	3,076	19.56
Chronic poverty	Oldest siblings dropping out	3,191	20.30
	Oldest not dropping out	12,531	79.70
Wealth proxy	Radio	8,124	51.67
	bicycle	7,383	46.96
	bed	6,196	39.41
School feeding program	Existence of the program	4,223	26.86
	No program in school	11,499	73.14

Averages of continuous variables

Variable	Mean
Age of household	44.3395
Age of pupil	11.0527
Number of stressful event	1.79754
Number of siblings	4.15399
Proportion of economically active persons in household	0.375195
Academic attainment of fathers	6.07982
Academic attainment of mothers	5.32687
Distance to school(km)	4.55874
Pupil Teacher ratio	108.216

5.2 Logistic regression analysis

This chapter discusses the finding of the regression analysis of determinants influencing the odds of pupils dropping out. The regression result and marginal effects are presented in appendix 1 and 2. We formulated accumulated modes to investigate the factors of different characteristics influencing primary school dropout. The definition of each mode can be found below.

Mode1: Household model for variables of child characteristics

Mode2: Household model for variables of characteristics of child and Household Head

Mode3: Household model for variables of characteristics of child, Household Head, and Household

Mode4: Mode3: Household model for variables of characteristics of child, Household Head, Household, and Community

Below is the discussion of findings on each variable in different modes.

The age of a pupil has a positive effect on dropout for both boys and girls over all the modes. The odds ratio for girls is slightly higher than boys as also attested by difference in marginal effect. This may imply that as growing older, girls get married, pregnant, or are married off by their parents. Regarding orphanage of a child, estimation shows that only boys in mode1 are influenced by father's death when they decide whether or not to stay in school. Thus, it means that after controlling for the other variables, orphanage of a child does not have strong impact on primary school dropout. While factor of biological child negatively affects the probability of dropout, it is statistically significant only for girls. Across all modes, it is expectedly evident that pregnancy has a strong impact driving girls out of school, which is also manifested in marginal effects with significance. The odds ratios and marginal effects of age of household head are significant over all modes. This is in agreement with literature review that older household head often appreciate the importance of education and tend to send their children to school. The finding also indicates that the role of parents' decision making have effects on children's decision. The gender of household head is found to be significant in Mode3 and Mode4. According to Kyei, the reason of female headship lowering risk of schooling can be attributed to the fact that female household head influences slowing down transition of children, especially girls to adulthood through early marriage or pregnancy. Children in a female headed household are also positively influenced by presence of counsel of a powerful role model (Kyei).

Father's education achievement has a significant effect on the both of boys and girls dropping out in the logistic regression and marginal effects while mother's educational level has an impact only on boys.

As the number of siblings grows, the probability of dropping out reduced. This is presented significant in our logistic regression as well as in marginal effects. When there

are more siblings in a household, children can substitute for household chores or child labor one another, or older siblings can educate younger brothers and sisters by e.g. reading with them. An impact of proportion of economically active household members is related only to boys in mode 3 and mode 4. Considering boys are more likely to quit school when fathers are missing, it seems that boys usually feel more responsibility to financially support their family and when other members can contribute to household wealth, they are inclined to stay in school. This also can be interpreted that girls may relatively have less chance to participate in economic activity than boys do. A variable of whether the oldest sibling has dropped out of school can be a proxy for chronic poverty in a household. It is evident that the odds that a child drop out increase when the older sibling has left school before completion. The relationship is statistically significant across modes3 and modes for the both of girls and boys. The marginal effects are relatively higher and significant as well. This implies that one's decision to leave school is not just made by a single event but is more of accumulated process. Two alternative variables- bicycle and bed- for measuring household wealth negatively and significantly affect girls' dropout. A variable on whether a household owns a bicycle has less significant influence on boys at 10%. This signifies that girls are more affected by the level of household wealth than boys. On the other hand, the influence of stressful events that decrease household wealth is more pronounced among boys. In case of natural disasters, sickness, marital disruption or financial difficulties, boys often stand in and offer child labor to their family. The impact of distance to school variable appears little on the probability that a pupil will drop out of school. This may be because Malawian government set up more structures of school since FPE policy implemented. An indicator of quality of education such as Pupil Teacher ratio has negative effects on dropout though statistically insignificant. The

existence of feeding program in primary school may also reduce the odds of students dropping out of school but shows insignificant. More research will be needed with available data base in the future to find out the effects of these variables.

VI. CONCLUSION AND POLICY IMPLICATION

We studied effects of various determinants on primary school dropout in Malawi. As could be expected, socioeconomic factors play a significant role of making differences in chance that students drop out of school. The evidence that distance to primary school has little impact on the probability of dropout or is statistically insignificant implies that FPE program has influenced improvement of accessibility to primary education and students' dropout rate. Although pupil-teacher ratio and existence of feeding program may show the negative relationship with dropout, further research is needed to be conducted with more data available considering that the paper included only variables of the nearest public primary school.

The fact that students' decision to leave school is mostly affected by household socioeconomic factors rather than the factors of school characteristics shows that pupils from poor household are less likely to stay in school. This is because they have to choose to support family or contribute to household wealth for their survival over to get education. In particular, considering that a variable for household where the oldest child has dropped out have a significant impact on drop out, poverty is a rooted and fundamental issue. It is therefore crucial to increase income generating opportunity for the marginalized household, and to set up a policy such as conditional cash transfer program for children in poor families to cancel out the opportunity cost as well as direct cost of schooling.

Next, pregnancy along with early marriage is a key factor that influences the probability of dropout with a large value of marginal effects. According to a qualitative research on female pupils in Malawi by Holkamp, girls get married in their early age because they do not know what to do in the future and see no differences other than marriage for their life.

Parents also marry their daughters off as a way of escaping from poverty or economically benefitting from such as bride price. Thus, sufficient employment opportunity should be given to girls, and the secondary and vocational education can serve to help them ready for job opportunity. Efforts for enacting legislation banning early marriage are needed to be made. Initiatives of strengthening the regulations against sexual violence should be undertaken to prevent girls from having unwonted pregnancy. Other policy solutions can include more child-sensitive plans such as community day care systems to enable girls to continue to go to school by sharing their burdens of childcare.

Moreover, given that pupils especially boys prone to quit school in the case of negative shocks experienced by their family, it implies that social safety net is not firmly built. We therefore recommend the policy to set up and expand social safety nets to protect people from social risks such as unemployment, illness, poverty, and disaster. Social security system to extend emergency aid, credit programs, and government subsidy is also needed to support those who face sudden stressful events.

Lastly, educational attainment of parents and the age and gender of household have profound impacts on the chances of pupils dropping out of school, which indicates the role of parents significantly influences a pupil’s decision to go to school. The government has to focus on adult education to change parental ignorant attitude and have knowledge on education of their children.

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Appendix A – *Odds ratio of logistic regression analysis for girls aged 6-18 with the odds of dropping out of school as dependent variable*

	Mode 1	**Mode 2**	**Mode 3**	**Mode 4**
LR chi	1842.59	1883.20	2371.35	2375.51
Prob >chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.4063	0.4152	0.5229	0.5238
Log likelihood	-1346.3076	-1326.0033	-1081.9292	-1079.8454
Characteristics of child				
Age child	1.72 (24.98)**	1.73 (24.92)**	1.73 (22.72)**	1.73 (22.71)**
Father dead	1.08 (0.55)	1.06 (0.42)	0.92 (0.51)	0.92 (0.50)
Mother dead	0.90 (0.62)	0.84 (0.87)	0.81 (0.98)	0.80 (1.01)
Biological child	0.65 (3.40)**	0.61 (3.89)**	0.6 (3.32)**	0.61 (3.19)**
Pregnancy	34.06 (9.53)**	29.69 (8.88)**	36.97 (8.34)**	37.77(8.37)**
Household head characteristics				
Age household head		0.98 (4.54)**	0.97 (5.83)**	0.97 (5.73)**
Female household		0.81 (1.51)	0.51 (4.01)**	0.52 (3.92)**
Education father		0.93 (4.27)**	0.95 (2.74)**	0.95 (2.90)**
Education mother		0.98 (0.93)	1.00 (0.21)	1.00 (0.01)
Household characteristics				
Number of siblings			0.80 (5.40)**	0.81 (5.33)**
Economically active members (%)			0.68 (1.30)	0.70 (1.22)
Oldest history			11.75 (19.70)**	11.76 (19.66)**
Number event			1.00 (0.09)	1.00 (0.12)
Radio			1.12 (0.87)	1.10 (0.75)
Bicycle			0.61 (3.79)**	0.62 (3.61)**
Bed			0.66 (3.04)**	0.62 (3.32)**
Community characteristics				
Urban				1.33 (1.53)
Distance to school (km)				1.00 (1.06)
Pupil Teacher Ratio				1.00 (0.66)
Existence of feeding program				1.08 (0.58)
N			7,900	

Appendix A – *Odds ratio of logistic regression analysis for boys aged 6-18 with the odds of dropping out of school as dependent variable*

	Mode 1	**Mode 2**	**Mode 3**	**Mode 4**
LR chi	962.26	1011.53	1644.89	1652.21
Prob >chi2	0.0000	0.0000	0.0000	0.0000
Pseudo R2	0.2523	0.2653	0.4313	0.4333
Log likelihood	-11425.5538	-1400.9142	-1084.2359	-1080.5757
Characteristics of child				
Age child	1.62 (23.62)**	1.63 (23.39)**	1.63 (20.62)**	1.63 (20.64)**
Father dead	1.42 (2.70)**	1.31 (1.92)	1.17 (0.97)	1.17 (1.01)
Mother dead	1.11 (0.61)	1.07 (0.37)	1.16 (0.71)	1.16 (0.72)
Biological child	0.80 (1.60)	0.82 (1.45)	0.88 (0.77)	0.88 (0.78)
Household head characteristics				
Age household head		0.99 (2.36)*	0.98 (4.74)**	0.98 (4.69)**
Female household		0.99 (0.04)	0.65 (2.69)**	0.64 (2.77)**
Education father		0.93 (4.29)**	0.94 (3.08)**	0.94 (3.34)**
Education mother		0.94 (2.85)*	0.96 (1.73)	0.96 (1.87)
Household characteristics				
Number of siblings			0.78 (6.41)**	0.78 (6.40)**
Economically active members (%)			0.23 (4.84)**	0.24 (4.74)**
Oldest history			16.59 (22.23)**	16.52 (22.14)**
Number event			1.06 (1.76)	1.06 (1.84)
Radio			1.02 (0.13)	1.00(0.07)
Bicycle			0.80 (1.71)	0.79 (1.76)
Bed			1.04 (0.27)	1.03 (0.26)
Community characteristics				
Urban				1.20 (0.93)
Distance to school (km)				1.00 (2.21)*
Pupil Teacher Ratio				1.00 (0.73)
Existence of feeding program				0.90 (0.81)
N			7,822	

Appendix B – *Marginal effects After Logistic(Girls)*

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Logistic Regression	**Mode1**	**Mode2**	**Mode3**	**Mode4**
	dy/dx	**dy/dx**	**dy/dx**	**dy/dx**
Age child	.01119 (15.24)	.0109492 (14.93)	.0068009 (11.54)	.0067605 (11.50)
Father dead	.0015797 (0.53)	.0012475 (0.41)	-.0009945	-.0009615 (-0.51)
Mother dead	-.002289 (-0.65)	-.0031588 (-0.93)	-.0024038 (-1.06)	-.0024636 (-1.10)
Biological child	-.009928 (-2.94)	-.0115966 (-3.26)	-.0075287 (-2.77)	-.0071541 (-2.68)
Pregnancy	.3846145 (4.20)	.3466404 (3.82)	.2919301 (3.13)	.2951564 (3.13)
Age household head		-.0003614 (-4.25)	-.0003255 (-5.02)	-.000318 (-4.95)
Female household		-.0040227 (-1.58)	-.0070772 (-4.27)	-.0069104 (-4.18)
Education father		-.0013939 (-4.11)	-.0006358 (-2.69)	-.0006722 (-2.83)
Education mother		-.0003726 (-0.93)	.0000581 (0.21)	2.98e-06 (0.01)
Number of siblings			-.0027059 (-4.80)	-.0026592 (-4.75)
Economically active members(%)			-.0048508 (-1.31)	-.004498 (-1.22)
Oldest history			.0759931 (8.98)	.0755133 (8.97)
Number event			-.0000345 (-0.09)	.0000467 (0.12)
Radio			.0013966 (0.87)	.0012025 (0.75)
Bicycle			-.0060817 (-3.64)	-.0057893 (–3.49)
Bed			-.0050371 (-3.01)	-.0056166 (-3.27)
Urban				.003837 (1.38)
Distance to school (km)				.0000243 (1.06)
Pupil Teacher Ratio				4.42e-06 (0.66)
Existence of feeding program				.0009949 (0.57)

Appendix B – *Marginal effects After Logistic(Boys)*

Logistic Regression	**Mode1**	**Mode2**	**Mode3**	**Mode4**
	dy/dx	**dy/dx**	**dy/dx**	**dy/dx**
Age child	.010514 (16.67)	.0097879 (15.67)	.005121 (10.95)	.0050622 (10.87)
Father dead	.0086741 (2.36)	.0059133 (1.73)	.0017102 (0.92)	.0017558 (0.95)
Mother dead	.0025299 (0.59)	.0014213 (0.36)	.0016815 (0.67)	.0016815 (0.68)
Biological child	-.005116 (-1.49)	-.0043529 (-1.36)	-.0013956 (-0.74)	-.0014011 (-0.75)
Age household head		-.0001881 (-2.33)	-.0002245 (-4.31)	-.0002198 (-4.26)
Female household		-.0001219 (-0.04)	-.0040541 (-2.88)	-.0041233 (-2.97)
Education father		-.0014138 (-4.20)	-.0006113 (-3.01)	-.0006614 (-3.25)
Education mother		-.0011803 (-2.82)	-.0004279 (-1.72)	-.0004584 (-1.86)
Number of siblings			-.0026821 (-5.39)	-.0026474 (-5.38)
Economically active members (%)			-.0153637 (-4.52)	-.0149105 (-4.43)
Oldest history			.0852442 (9.58)	.0838016 (9.51)
Number event			.0006015 (1.75)	.0006299 (1.83)
Radio			.0001774 (0.13)	.0000893 (0.07)
Bicycle			-.0023078 (-1.69)	-.0023697 (-1.75)
Bed			.0003837 (0.27)	.0003637 (0.25)
Urban				.0020576 (0.87)
Distance to school (km)				.0000319 (2.17)
Pupil Teacher Ratio				-3.74e-06 (-0.73)
Existence of feeding program				-.0011305 (-0.83)

(*) dy/dx is for discrete change of dummy variable from 0 to 1

Note. Figures below dy/dx are values of z statistics

Appendix C – Distribution of IHS3 Sample EAs and Households by District, Urban/Rural Areas

	Total		Urban		Rural	
District	**EAs**	**Households**	**EAs**	**Households**	**EAs**	**Households**
NORTHERN REGION	96	1534	10	160	86	1374
Chitipa	24	384	2	32	22	352
Karonga	24	384	4	64	20	320
Nkhata Bay	24	382	1	16	23	366
Rumphi	24	384	3	48	21	336
CENTRAL REGION	312	4985	70	1116	242	3869
Dedza	24	383	1	16	23	367
Dowa	24	384	1	16	23	368
Kasungu	24	384	1	16	23	368
Lilongwe City	36	572	36	572	0	0
Lilongwe, non-city	36	574	0	0	36	574
Mchinji	24	384	1	16	23	368
Mzimba	24	384	0	0	24	384
Mzuzu City	24	384	24	384	0	0
Nkhotakota	24	384	2	32	23	352
Ntcheu	24	384	1	16	23	368
Ntchisi	24	384	1	16	23	368
Salima	24	384	2	32	22	352
SOUTHERN REGION	360	5752	60	957	300	4795
Balaka	24	384	2	32	22	352
Blantyre City	24	383	24	383	0	0
Blantyre, non-city	24	383	0	0	24	383
Chikwawa	24	384	0	0	24	384
Chiradzulu	24	384	1	16	23	368
Machinga	24	384	1	16	23	368
Mangochi	24	383	1	16	23	367
Mulanje	24	384	0	0	24	384
Mwanza	24	384	4	64	20	320
Neno	24	384	0	0	24	384
Nsanje	24	384	2	32	22	352
Phalombe	24	384	1	16	23	368
Thyolo	24	382	0	0	24	382
Zomba City	24	382	24	382	0	0
Zomba, non-city	24	383	0	0	24	383
TOTAL	768	12271	140	2233	628	10038

Resource: Basic Information Document(2012) in “Malawi Third Integrated Household Survey(IHS3) 2010-2011”