GIRLS VERSUS BOYS?
FACTORS ASSOCIATED WITH CHILDREN'S SCHOOLING IN RURAL MALAWI

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Abstract

The decision on whether to send children to school or not is essentially one made by the household. Recent research has increasingly focused on how intra-household bargaining affects the school participation decision, and with special focus on the mother's position relative to the father. In this thesis I have sought to identify factors affecting children's schooling, with special focus on child's gender, parents' role and preferences and how the school participation outcome may be resource constrained.

I hypothesized that parents' education levels are positively related with children's schooling, but that special treatment is given to children of same gender as themselves. I employed three school outcome measures in order to capture the multiple entry points of influence: the probability of annual school participation, likelihood of delayed school progression and probability of dropping out of primary school. I found in general supporting evidence on behalf of mothers' positive effect, although evidence of gender-based preferential treatment in terms of girls' school progression. Regarding fathers' influence the results were mixed, showing a positive relationship in terms of girls' school attendance and boys' school progression, the latter indicating preferential bias to boys; whereas girls' primary school continuation or completion was negatively affected.

I hypothesized that children's schooling would be positively affected by residing in a female-headed, given women's stronger bargaining position; but also that the ability to follow up on these preferences may be resource constrained. Using the three outcome measures I found some support for the latter hypothesis, and for girls especially, although the evidence is empirically weak.

The ability to follow up on preferences may hold for other households as well. I therefore further hypothesized that poverty and labour constraints, the latter also encompassing gender-based labour constraints, deter children's schooling. Using two Logit models, controlling for random- and fixed-effects at household and individual level, I investigated the ability to follow up on preferences for sending children to school. I found supporting evidence for presence of poverty constraints when controlling for random effects, although weak evidence for girls. In terms of labour constraints the evidence was mixed, in part suggesting a rejection of my stated hypotheses.

The dominant inheritance system and residential location may affect internal bargaining power. In order to investigate this I hypothesized that a child's school progression would be negatively affected when both the residential location and the predominant inheritance system in the area had an opposite gender focus than the sex of the child. Using Logit models I found that boys' school progression was likely to be negatively affected by residing matrilocally within a matrilineal society as opposed to patrilocal residence in a patrilineal society; whereas girls' school progression was positively affected by residing patrilocally within a matrilineal society as opposed to in a patrilineal society. Whether the results are a question of regional bias or different perceived investment returns to children's schooling is uncertain.

Overall poverty alleviation seems to be the centre point in improving children's schooling outcomes, whereas the role of land and education in bargaining deserves further scrutiny.

List of Tables

List of Figures

List of Tables in Appendix I

1. INTRODUCTION

Educational attainment has long been at the forefront of development policies. Achieved educational levels affect both individuals and the broader society; directly enabling improvement of own welfare, and indirectly generating wider growth and development through the individuals' choices (Mason & Rozelle 1998). The Malawian government has aimed at an eight percent poverty reduction by 2011, as stated in the Malawi Growth and Development Strategy for 2006-2011 (IMF 2007:5); and given its demographical composition, heavily composed of children and adolescents, the focus on poverty alleviation immediately commands attention to education.

The past decades have brought on considerable changes in the educational offer. Primary school fees have been removed, distances to schools reduced and the curriculum modified to accommodate both girls and boys (Maluwa-Banda 2004; Moyi 2010). However, this did not bring on the expected increase in achieved educational levels (Moyi 2010). Late enrolment, sporadic attendance and low levels of completion are still symptomatic for the education many rural Malawian children receive (World Bank 2010). Understanding the determinants of school participation, delayed school progression and drop-outs is tantamount in order to improve levels of human capital, and with school attendance being neither compulsory nor easily enforceable the focus must centre on the households as the most important decision-makers (Lloyd & Blanc 1996; Moyi 2010). Households face a multitude of choices and constraints, and the school participation decision is shaped by these. Schooling involves both direct and indirect costs (Arunatilake 2006), and children being an important resource in a farm-household setting their time and labour power is weighted against these costs (Shimamura & Lastarria-Cornhiel 2010). Consequently, resource poverty may deter children's school participation and educational attainment.

Recent empirical evidence indicates a rejection of the notion of common preferences within a household, as implied in the unitary household model, instead asserting different preferences by household members (Quisumbing 2003). Investment and resource allocation could therefore be a bone of contention within the household, whereby bargaining between the different parties occur

before reaching a decision outcome. In such a situation we expect difference in parental preferences to be reflected in the school participation decision of girls and boys. Better educated parents may be able to assert a stronger bargaining position (Frankenberg & Thomas 2001), which would suggest that parents' education affects the school participation decision, thereby reflecting their preferences and perceived returns to education (Glick & Sahn 2000).

Preferences and the decision-making process may be affected by circumstances external to the household, with emphasis here on inheritance system and residential location. Firstly, dominant inheritance principles such as lineage of inheritance may influence parental perceptions, the gender focus supplanting itself to expected future returns of investment in children and their role within the household (Odaga & Heneveld 1995). Secondly, the gender focus within the dominant inheritance system may also affect parents' bargaining stance and threat points, whereby the one stronger positioned according to inheritance principles can take advantage of this in the decision-making process. Thirdly, residing in a village with proximity to one's own relatives could strengthen the bargaining position of that parent (Lunduka 2009).

The objective of this study is to investigate factors internal, and in part external[1], to the household that may influence the school participation decision. Using a three year household panel for years 2006, 2007 and 2009 I will investigate the following research question:

What factors influence and constrain children's school participation,
and do the factors differ by gender?

As the decision is primarily one made by the parents, special emphasis is given to mother and father. I therefore focus on the parents' levels of completed education and the sex of household head, and how these factors serve as relative bargaining power. Their influence on children's schooling is investigated through six hypotheses, employing three school outcome measures in order to capture the multiple entry points of influence. I use school participation as measured on an annual basis, probability of delayed school progression as compared to the official school entry age and likelihood of dropping out of primary school. However, the ability to follow up on preferences and perceived returns may largely be determined by internal household resources.

[1] The external factors are here restricted to the external environment as defined by the dominant inheritance system and residential location, other external factors which may influence the school participation decision are not to be analysed.

This is therefore investigated by four additional hypotheses, focusing on annual school participation. Moreover, since dominant lineage of inheritance and residential location may be a source of bargaining power and may adjust parental preferences and perceived returns, their effect on children's school progression is investigated through four hypotheses.

The thesis is structured as follows: In Section 2 I present background information on Malawi's education system, the gender bias present and the livelihood and inheritance setting in which households are found. Section 3 takes us through the literature related to the school participation decision. The analysis is based on four main building blocks, inspired by Quisumbing (2006): parental preferences, returns to investment, constraints and the bargaining involved. In Section 4 I provide a conceptual framework integrating human capital investment into a household model with internal bargaining, and based on this I provide an overview of the research question to be investigated and the hypotheses to be tested. Section 5 focuses on the methods and data involved, where I discuss possible data weaknesses, give an overview based on descriptive analysis, and introduce the four models used. Section 6 is dedicated to econometric analysis and discussion of results, and the findings are reported on a conclusive note in the final section.

2. BACKGROUND

2.1 The education system of Malawi

The Malawian education system consists of government and private run schools. The former being the norm in rural areas, this will be the main focus here. The public school system is described as a 8-4-4 structure, with the first eight years spent in primary school and continuing with four years in secondary school, where school fees are introduced (World Bank 2010). Tertiary education is restricted to the richer urban areas, and in 2006 only 0.1% of the Malawian population were reported to be enrolled in the last step of four years (Government of Malawi & World Bank 2006).

Primary school is subdivided into junior and senior primary school, the first four years in Standard 1-4 and the next four in Standard 5-8. Primary school attendance is not compulsory, but every child has the right to five years of education (Government of Malawi & World Bank 2006). School entry is officially at age six, but late enrolment characterise the Malawian school system. Grade repetition is common, especially in rural areas and survival rates through primary school, measured by reaching both Standards 5 and 8, are low (UNESCO 2008). School participation peaks around age eleven, and with reduced probability of entering Standard 1 past this age (Shimamura & Lastarria-Cornhiel 2010; World Bank 2010). These combined features result in a blurred attendance age.

Despite free primary school, non-participation is still reported for one third of all children (Government of Malawi & World Bank 2006). Households continue to cite direct costs as an important impediment to school participation (Kadzamira & Rose 2003). Although distances to primary schools are in general fairly short, excepting the Southern region (Government of Malawi & World Bank 2006), it remains one of the main deterrents to on-time enrolment in Malawi (Moyi 2010). Once enrolled school participation rates are susceptible to external shocks, which the droughts in 2002-03 clearly indicated when drop-out rates increased drastically (World Bank 2010). Moreover, family responsibilities are identified by household heads as an important cause for drop-outs for both genders (World Bank 2010).

Secondary schools consist of junior and senior secondary, more broadly named Form 1-4. Each lasts two years and both demand payment (Shimamura & Lastarria-Cornhiel 2010). Within the Malawian school system we identify two main secondary school types, excluding the private secondary schools. A graduated system selects the best students to attend the conventional secondary schools while the remaining students are left to the community day secondary school (CDSS) (UNESCO 2008). The former are in general better endowed with resources, but only ten percent of the communities are reported to have one located within 2 kilometres of the village as opposed to 30 percent for a CDSS (Government of Malawi & World Bank 2006). The age group for secondary school age is 14-19, but high repetition and drop-out rates obscure the attending age. Upon completion students are granted the Malawi School Certificate of Education (MSCE) (UNESCO 2008).

2.2 Gender and education

In Malawi girls are found to be disadvantaged in terms of schooling and this is related to a number of factors. Firstly, fear of rape or mistreatment cause parents to delay girls' school enrolment, worrying for their girls' safety, and long distances to school aggravates this, as cited by a study by Maluwa-Banda (2004). When girls reach puberty many parents view them as especially vulnerable, fearing pregnancy and thereby also the inability to marry them off well. A dominant course of action is therefore to withdraw the girls from school. Nevertheless, pregnancy remains one of main causes for female drop-outs (Maluwa-Banda 2004; World Bank 2010). Consequently, pregnancy acts as a double-edged sword for girls' schooling. Secondly, a culture of early marriage leads to withdrawal of girls from school, often before finishing primary (World Bank 2010). Poverty, compounded by the incidence of shocks, has strengthened this trend as girls are married off early in order to reduce internal constraints (ActionAid 2006). Thirdly, the ongoing HIV/AIDS epidemic is found to particularly affect girls' schooling, as gender-based division of labour at home implies that girls are more easily withdrawn from school to undertake household chores (Munthali 2002). Combining these elements results in higher drop-out rates from primary school for girls than for boys (UNESCO 2008), especially obvious during the senior primary, and thereby reducing the entry of girls into secondary school (Maluwa-Banda 2004).

2.3 Malawian livelihoods

Agriculture is the backbone of the Malawian economy, both in generating export earnings through tobacco sales, and in sustaining the majority of the inhabitants' livelihoods. The agricultural sector is of great importance to the overall economy, contributing 40% to the country's total GDP, and whereof a substantial part comes from small scale farming, 30-35% of total GDP. Moreover, it serves as the livelihood basis for the clear majority as more than 80% of Malawi's population reside in rural areas. Rural households are dependent on agriculture either in terms of farming own or rented land, working as casual wage labour (*ganyu)*, or a combination of these. However, out of the total population 52.4% were estimated to live below the Malawi-specific poverty line in 2005 (Government of Malawi & World Bank 2007). Since all the sampled households reside in rural areas this demands a closer look at the agricultural setting.

Having land as the livelihood basis involves a certain dimension of vulnerability. The average landholdings are small, and the traditional tenure system of customary land ownership prohibits sale resulting in relatively fixed land endowments. Increasing population pressure on the already scarce land combined with a largely rain-fed agriculture aggravates the situation (Devereux et al. 2006). Moreover, access to input and output markets differ substantially across areas, and markets are thin. As a consequence participation is a risky endeavour (Chirwa et al. 2006). The seasonal nature of agriculture adds another dimension of vulnerability. Labour resources are exhausted during the peak season, from December to January, while left largely underemployed the rest of the year (Wodon & Beegle 2006).

2.4 Inheritance systems

The customary tenure system is characterised by two inheritance systems, both matrilineal and patrilineal inheritance systems prevail. The matrilineal system implies descent, succession and inheritance through the mother's lineage (Peters 2002), while the patrilineal system centres around the father's lineage. Land is the main object of inheritance, within the system of customary land tenure, and is inherited upon marriage (Redaelli 2008). During marriage both wife and husband may access the land, but upon death or divorce the non-inheriting party may lose all access, in the worst case being forced back to his or her maternal village. Consequently, the tenure security is weak for the non-inheriting party, and as land serves as the main basis for

most households' livelihood strategies the inheritance system is of great importance (Lunduka et al. 2009).

Geographically we find the matrilineal system in the southern parts and the patrilineal in the northern parts of Malawi, and within each area three types of residential locations emerge. Households are found to reside in either the wife's village, matrilocally, in the husband's village, patrilocally, or neo-locally. Neo-local residence encompasses the cases where neither the female nor male has any previous affiliation with the residential village (Lunduka 2009). However, matrilocal residence occurs mainly within the matrilineal societies, and patrilocal within the patrilineal societies. Lunduka (2009) argue that only under special circumstances do households reside matrilocally within a patrilineal area, such as in the lack of male heirs or in the case of abundant land. On the other hand, the past decades have brought on a change within the matrilineal system, whereby households increasingly choose to settle in the husband's village, patrilocal residence, despite following matrilineal descent (Holden et al. 2006; Ngwira 2003). The husbands' desire to secure his foothold is argued as one reason for this trend. Holden et al. (2006) note that despite residing in a traditionally matrilineal society women who were residing in the husbands village did not expect their daughters to have inheritance rights to the land. Instead the land would return to the husband's maternal line of descent. Residential location is therefore assigned great weight within the Malawian context because the moving party usually loses all claims to land within own village, regardless of dominant system. Consequently, the party bringing land into the marriage often has the strongest foothold (Lunduka et al. 2009).

The two inheritance systems differ in two important aspects. Firstly, if the male head of a household residing patrilocally in a patrilineal area, then the widow is usually allowed to stay in the patrilocal village; whereas a similar situation within the matrilineal area usually results in the widowed husband having to return to his own village upon the death of the wife. Despite being allowed to stay this does not place the widowed wife in a secure position since her future lies in part in the hands of the husband's family (Lunduka et al. 2009). Secondly, within the patrilineal system the male head of the household is the most important decision maker, while within the matrilineal system the maternal uncle may play an important role (Redaelli 2008). Nevertheless,

the women's position is considerably strengthened within the matrilineal system as compared to the patrilineal (Munthali 2002).

2.5 The study sites

This study focuses on six districts in Malawi: Kasungu and Lilongwe located in the Central Region; and Thyolo, Zomba, Chiradzulu and Machinga located in the Southern Region, see Figure 1. Several factors distinguish the two regions, and the unsurveyed third, the Northern Region. The southern parts exhibit the highest population density; and the situation is further aggravated by a higher incidence of poverty and prevalence of reported HIV/AIDS (Government of Malawi & World Bank 2007; World Bank 2010). The Central Region also has a high population density, whereas the concentration of poor is the least severe compared to the two other regions (Government of Malawi & World Bank 2007). Furthermore, within the regions there are clear district-specific characteristics. Lilongwe district encompasses the country's capital, giving a different external environment than what is found in Kasungu which is further from the city centre and where tobacco is grown extensively (Lunduka 2009). Zomba and Thyolo are found to have the highest population density in the country (Lunduka 2009), the latter covered in part by tea-estates. However, whereas Zomba has in general a high level of completion rate in educational levels, especially in secondary school, Thyolo comes among the districts with the lowest completion rate in primary school. Only Machinga district, in this sample is found to have a lower rate of completion in primary school. Notably the district of Zomba encompasses the urban area of Zomba which may give higher rates than on average across the district. Chiradzulu, on the other hand (World Bank 2010).

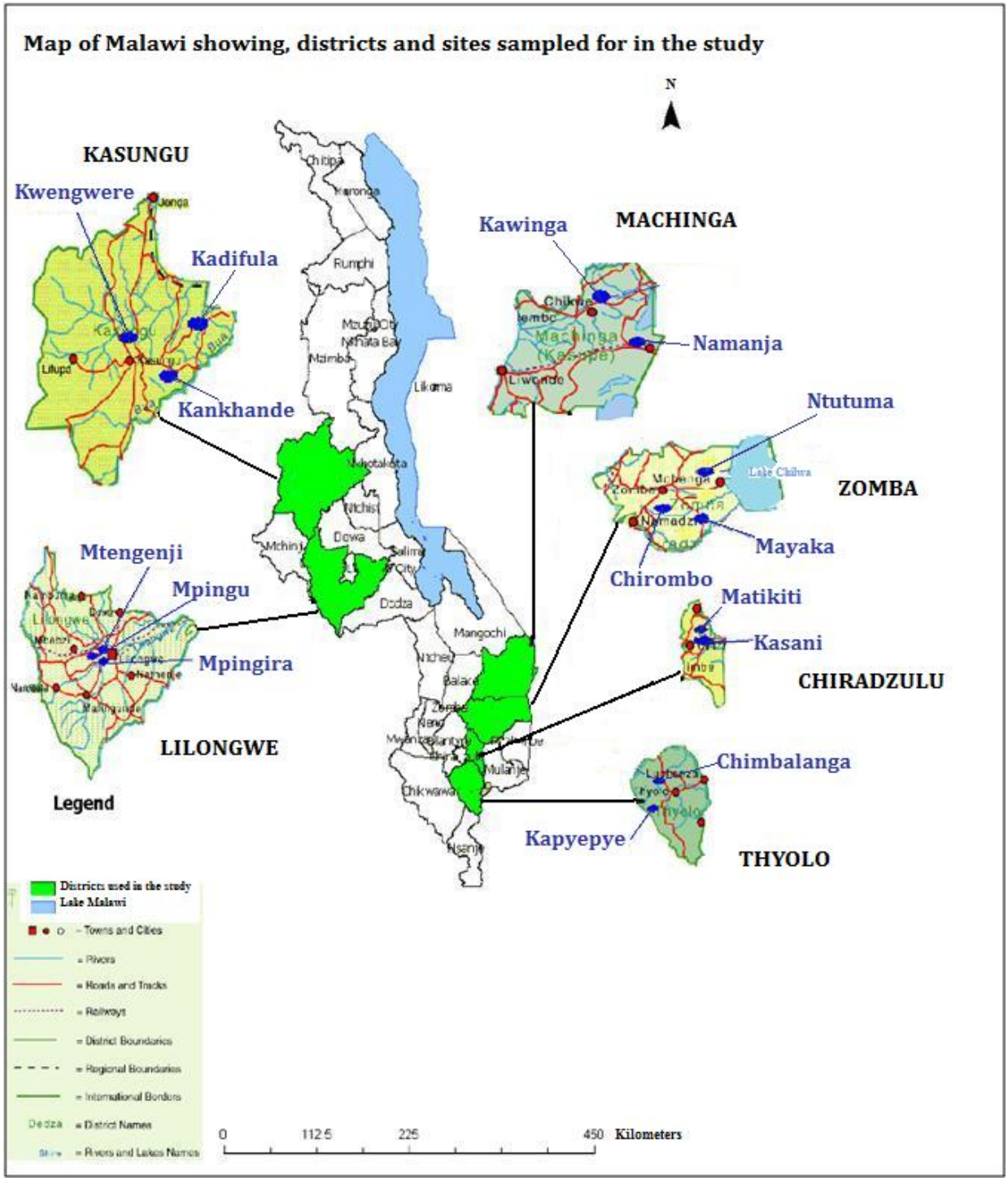

Figure 1: Map of Malawi showing districts and sites sampled for in the study

Source: (Lunduka 2009)

3. LITERATURE REVIEW

3.1 The decision-making unit

Becker (1960) first introduced human capital investments into a household utility maximizing function, and numerous attempts have since been made at understanding the underlying rationale for investing in human capital. The literature distinguishes between two broad groups of models for assessing households' decision-making. The first group is that of the unitary household model which disregards internal bargaining by assuming either a dictatorial household head or same preference structure for all household members (Thomas 1990). This type of model further assumes that all resources are pooled. The second group encapsulates the intra-household decision-making models, which allows for individual preferences without imposing individual utility functions. Within the latter group three approaches emerge: *(i)* The Nash cooperative bargaining models which gives Pareto-efficient outcomes, and assumes individual threat point as determined by their fall-back option upon divorce (Manser & Brown 1980). Then, *(ii)* the collective models which also yield Pareto-efficient outcomes, but applies sharing rules rather than bargaining methods (Chiappori 1988). And, *(iii)* the non-cooperative bargaining model, exemplified by Lundberg and Pollak's (1993) separate spheres model, where the threat points are withdrawal within the marriage as defined by traditional gender roles rather than divorce.

Although all are in part overlapping, the bargaining methods have the advantage of revealing how preferences eventually cumulate in a decision outcome by acknowledging the bargaining process involved (Quisumbing 2003). On the other hand, the collective model is more adaptable to empirical testing and therefore rejecting the notion of common preferences and income pooling (Emerson & Souza 2002; Quisumbing & Maluccio 2000; Vermeulen 2002). Nevertheless, choice of model may have widely different policy implications, especially when differing between the unitary model and the rest as the former ignores internal difference in preferences. Past decades have seen an increased focus on testing the notion of common preferences as implied in the unitary model (Manser & Brown 1980; Thomas 1990). Parents being the household heads and in most cases the decision-takers their preferences on educational needs are therefore important to acknowledge.

3.2 Parental preferences

A common assumption for household models is that parents are altruistic in their behaviour towards children. They care about children's present and future well-being in terms of consumption and human capital accumulation (Emerson & Souza 2002; Quisumbing 2006). Although assumed altruistic, this does not exclude gender-based parental altruism, whereby parents give special preference to same gender as themselves. Alternative explanations are put forth in explaining this, such as greater empathy for children of same sex as themselves (Alderman & King 1998) or the result of division of labour in children's upbringing when the father may spend more time with the sons and mothers with daughters (Thomas 1994). Emerson and Souza (2002) find evidence of gender egoism affecting child labour, whereby mother's education is observed as negatively related to probability of girls working and the same relationship applied between fathers and sons. Gender bias may also take the form of both parents favouring the same gender, usually the boy, as exemplified by Emerson and Souza (2002) who also detect that both parents' non-labour income increase the school attendance more among boys than girls in Brazil. Conversely, parents may exhibit egalitarian bequest motives, whereby intergenerational transfers, for example land, is given interchangeably for schooling, as observed in Indonesia (Quisumbing & Otsuka 2001) and Kenya (Shreffler & Nii-Amoo Dodoo 2009).

However, mothers' preference function is often given special focus, based on an implicit assumption that mothers are more altruistic. Empirical evidence indicates that female-headed households give more preference to children than the equally well-off male headed counterparts (Lloyd & Blanc 1996). Similar findings are made in Malawi where female-headed households are observed to invest more in children's education compared to male-headed households (Government of Malawi & World Bank 2006). This is also evident in terms of school outcome measures, as children in female-headed households have reduced probability of delayed school attendance (Moyi 2010) and increase likelihood of entering senior primary school (Nankhuni & Findeis 2003). Agarwal (1994), on the other hand, questions the degree of altruism observable in adult females' behaviour, arguing instead that the decisions are a result of external factors affecting the perceived returns, illustrated by mothers' behaviour in northern South Asia who tend to invest more in their sons' education than in their daughters'.

In Malawi there is there is tradition for taking in extended family members, as in other African countries, and the HIV/AIDS epidemic has contributed to this fostering trend (Brown & Park 2002; Munthali 2002). Special preference can be argued to be given to household members that are more closely related. A hierarchical structure might be built up, where being the biological child of the household head may positively impact school enrolment (Burke & Beegle 2004). Studies confirm this trend in Malawi, where orphaned adolescents are found to be less likely to attend school and progress to senior primary than their non-orphan counterparts (Government of Malawi & World Bank 2006; Nankhuni & Findeis 2003). Similarly, the "closely related" argument could apply to the first-born child (Behrman & Taubman 1986). However, empirical work suggests an opposite trend in developing countries whereby the older siblings are engaged in household chores or income-generating activities in order to relieve the parents' work burden (Emerson & Souza 2008; Fafchamps & Wahba 2006); although boys are also found to be an exception to this (Huisman & Smits 2009).

Parents' preferences are closely linked with cultural norms (Glick & Sahn 2000), and they combine to shape the perceived incentives for investing in human capital. Especially girls are argued to be negatively affected by the extent to which parental behaviour and preferences are associated with cultural norms and traditions (Huisman & Smits 2009). Davison and Kanyuka (1990) claim that Malawian households regard girls as inferior to boys in terms of abilities and therefore deter girls from attending school. This contrasts to Chimombo et al. (2000) who note that both parents' perceptions seem to reflect an understanding that education is important for both girls and boys, possibly reflecting a change in perceptions within the past decade. Notably this did not materialize in terms of their children's school participation and the report accrues this to the lack of education among the parents themselves. Focusing more on future needs rather than children's abilities allows for a different observation. That is, male heads are cited as contending negative side-effects of leaving the girls' school participation decision to the mother. This because the mother views undertaking household chores as an important step to becoming a good housewife, thereby delegating more chores instead of sending the girls to school (Chimombo et al. 2000). Identification of preferences per se is clearly complicated as observable behaviour is affected by perceived returns to investing in children.

3.3 Investment in human capital – returns to schooling

Returns to education are understood in both a private and the wider societal setting. Private returns include the future productivity and wage increases that educational attainment may offer, combined with improvements in own well-being (Devereux et al. 2006) and social status gained through higher consumption of education (Schultz 2003). Society at large is argued to benefit from individuals' education through wider growth, as the macro-literature has focused extensively on (Krueger & Lindahl 2001). Recent studies have assigned special value to girls' schooling, arguing that it generates positive externalities such as reduced fertility rates which is desirable giving population pressure (Schultz 2002). The emphasis being on internal household resource and investment allocations, I will restrict the focus here to the private returns. However, it should be noted that ignoring the social returns, as households often do, may result in a sub-optimal investment outcome (Pasqua 2005).

As noted, the traditional argument is that investment in education is made based on the expectation of future work. The influential Mincerian wage regression states a linear relationship between years of schooling and the log wage acquired by an individual, arguing that this relationship reflects the returns to schooling (Mincer 1974). Higher returns to education in the job market create greater incentives for investing in human capital, and the structural economy affect these returns. Especially within a farm household setting the returns to education may be less clear (Jacoby & Skoufias 1997), and agricultural sectors has traditionally valued learning by doing more than other sectors (Canagarajah & Coulombe 1997). Nonetheless, it is argued that school exposure generates positive learning spirals through eased dissemination of information (Schultz 1975). Rosenzweig (1995) further claims that educational attainment stimulates to increased probability of adopting new technologies, resulting in increased productivity, and improvements in managerial farming skills. On the other hand, parents are found to cite the lack of working possibilities as an important reason for not investing in children's education (Boyle et al. 2002).

No individual being alike, the marginal returns to schooling may differ by child. This has caused much head-ache in separating the actual returns to schooling from individual ability (Krueger & Lindahl 2001). Individuals are endowed with "idiosyncratic human capital technologies"

(Emerson & Souza 2002), and these child-specific characteristics may affect the ability to accumulate knowledge in school (Quisumbing 2006). Children's own interest may influence this disposition and investment returns. Lack of interest has been postulated to hamper school participation (Boyle et al. 2002), contrasting a recent study from Malawi where lack of interest was seldom the reason for dropping out (World Bank 2010). Nevertheless, individual marginal returns to education may reflect the allocation of school investment.

Jacoby and Skoufias (1997) emphasize the external conditions, such as cultural and societal restrictions, that may affect the investment returns. Gender-based division of labour often downplays the perceived benefits of education for girls, their next step in life being motherhood and undertaking household chores (Davison & Kanyuka 1990). Furthermore, gender discrimination in the labour market reduce the expected returns to investing in girls compared to boys (Colclough et al. 2000), and within the Malawian context both genders are reported to view girls' labour market prospects as dire (Odaga & Heneveld 1995). However, the outcome is not necessarily biased towards boys. Quisumbing et al. (2004) argue that returns to education in off-farm work largely condition the egalitarian bequest motives they observe in Philippines and Indonesia. Moreover, other markets may also affect the returns to education, such as the marriage market. Given assortative matching a better educated daughter improves the parents' chances of finding a well-educated husband which may be desirable regardless of parental altruism (Echevarria & Merlo 1999; Jacoby & Skoufias 1997).

Private returns are also understood within a household setting, as educating children may generate positive externalities to the household. In settings with imperfect capital markets and lacking organised safety nets the responsibility of care-taking falls into the hands of children and educational attainment may improve their ability for future care-taking (Brown & Park 2002; Quisumbing 2006). Given that older parents perceive expected future returns as more immediate (Mauldin et al. 2001) school participation would be higher in households with older household heads. Furthermore, parents may be more inclined to invest in human capital that they expect to derive future benefit from in terms of old age support. Emerson and Souza (2002) argue that parents' preferential treatment of boys in Brazil is attributable to the expectation that boys will take care of them when they age.

Combining returns to education in terms of farming skills and the old age argument requires focus on the role of inheritance systems in affecting the investment returns. Patriarchal societies being the norm boys inherit the land and are therefore also expected to derive the greatest benefit from improved farming skills (Jacoby & Skoufias 1997). Empirical studies indicate that girls' schooling is viewed as a loss in parental investment in patrilineal societies as they are expected to move upon marriage (Odaga & Heneveld 1995); and Ngwira (2003) goes so far as characterizing daughters as "transient" in patrilineal societies in Malawi. On the other hand, Quisumbing and Otsuka's (2001) study of a matrilineal inheritance system in Indonesia do not accrue increased investment in girls' schooling to the matrilineal inheritance systems itself, instead they pinpoint parental preferences and returns to education in market work.

However, within an inheritance system the returns to investment may differ by parent. A number of studies from matrilineal societies note that the father contributes substantially more in financing children's schooling than the mother, exemplified by the matrilineal Akan in Ghana (La Ferrara 2007), and in Tanzania (Machimu & Minde 2010); following the argument that this investment is more secure than land investments. By contrast, male heads, cited in Chimombo et al.'s study (2000) from Malawi, claim that the school participation decision was in the hands of the wife given matrilocal residence. Upon death or divorce children are expected to stay in the residential village, implicitly cutting ties between the children and the moving party (Lunduka 2009). Matrilocal residence has in light of this been argued as detrimental to children's schooling, as the father abandons all responsibility for children's future (2007). Notably among the Akan the wife and children can lose access to land within the matrilineal kin upon death of the husband (La Ferrara 2007), and therefore heterogeneous practices within and between matrilineal societies may account for difference in responsibilities and perceived investment returns.

3.3 Consumption of education

Sending children to school is essentially an investment in human capital and thus the future, but can also be viewed as consumption good. Glewwe and Jacoby (2004) notes that given a two-sided nature of education, both as a consumption and an investment good, the households resources are inseparable from children's school participation. In the presence of credit

constraints, investment and consumption of human capital is affected by internal household resources and composition, while in the case of no credit constraints the households' resource level will still affect the participation decision if education is also viewed as a consumption good (Glewwe & Jacoby 2004).

Consumption or investment in a good is not without costs, and educating children involves both direct and indirect costs. The former includes out-of-pocket expenses, such as school fees and purchases of books, uniforms and stationary (Arunatilake 2006). Indirect costs are the opportunity costs that households face in foregoing labour allocations to income-generating activities or time allocation to leisure (Arunatilake 2006). The magnitude of indirect costs depends on supply and demand side factors, the former related to the educational offer that households face. The literature has given weight to distance to school, identifying this as an important opportunity cost, and to the quality of education offered. Student-teacher ratios are often used as proxies for teaching quality, lacking more detailed data on expenditure per student or curriculum taught (Lloyd et al. 1998). Understanding the opportunity costs related to demand side factors, however, necessitates a closer look at the household as the decision making unit.

3.4 Household characteristics and constraints

Regardless of the underlying rationale, observable household characteristics are found to be important factors associated with school participation. Households' investment decisions are predominantly based on internal resources in presence of imperfect and incomplete markets and children become a critical resource which they have to allocate (Shimamura & Lastarria-Cornhiel 2010). The opportunity cost of sending children to school is weighted against leisure and work alternatives, and the investment returns compared with alternative investment allocations in the presence of credit constraints (Schultz 1993). A high discount rate and risk pertaining to the investment returns, such as child survival, may result in a trade-off between immediate income needs and future income earnings (Jacoby & Skoufias 1997). Consequently, a resource constrained household may be forced to reduce its investment in human capital, thus exacerbating the future prospects of escaping poverty. Furthermore, this may require a trade-off between the desire for equal treatment and investing in the child that is expected to the reap

highest marginal returns and thereby benefiting the family as a whole; the latter often resulting in favouring of boys over girls (Behrman et al. 1982; Quisumbing 2006).

3.4.1 Household structure and composition

Ability to finance investment and consumption of education depends on the available labour resources, and the literature has given great weight to household composition. Single-headed households may face tighter labour constraints, necessitating use of child labour at the expense of schooling (Huisman & Smits 2009). Others argue that especially female-headed households are disadvantaged, accruing this to financial and social insecurity (Amin et al. 2006). In Malawi female-headed households are on average poorer than male-headed counterparts in both rural and urban areas (Government of Malawi & World Bank 2006). Moreover, their dependency-ratio is often higher, negatively affecting the ability to generate income (Kennedy & Peters 1992). Consequently, binding labour constraints are found to induce more use of child labour among female-headed households than male-headed households (Nankhuni & Findeis 2004; Takane 2008), and which may deter school attendance.

Household size both provides resources and sets constraints, and the effects on school participation are uncertain. Becker's quantity-quality trade-offs (Becker 1960) and the conception of larger family sizes having a negative effect on investments in children's education is contrasted by empirical evidence (Patrinos & Psacharopoulos 1997). Instead a "specialization of children" may occur, where household heads in larger households may be forced to chose whom to send to school, thereby not reducing the probability of attending school for all children (Chernichovsky 1985). However, certain trends may emerge within the group of siblings. Presence of older siblings or adult females is posited to reduce the opportunity cost of sending girls to school since they undertake responsibility for household chores (Glick & Sahn 2000). Conversely, presence of younger siblings and elderly aggravates the work load, and studies have found that this burden is especially felt by girls (Levison & Moe 1998). On the other hand, presence of older extended family members may also reduce children's domestic responsibilities and motivate to continued education (Chernichovsky 1985). Similarly, probability of delayed school attendance is also found to be inversely related to number of children under age five,

although without a clear explanation for why (Moyi 2010). Household composition evidently pulls the school participation in mixed directions.

3.4.2 Household endowments

Poverty is stated as one of the main deterrents to children's schooling. Firstly, the opportunity cost involved in sending children to school is expected to be higher than among wealthier households as they have fewer resources to draw upon. Secondly, in the case of imperfect markets poorer households are more likely to be credit constrained thereby inhibiting investments such as in education (Huisman & Smits 2009; Jacoby & Skoufias 1997). As households' income and consumption is difficult to estimate, and moreover presents potential problems of endogeneity, socioeconomic characteristics are used extensively in the literature in order to capture the possible poverty effect (Mani et al. 2009).

Land is often an important wealth indicator within a rural household setting. More land is a sign of wealth, and wealthier households are expected to consume more of education, assuming education is a normal good; or alternatively be less investment constrained. However, a number of drawbacks are involved in using land to explaining poverty effects in terms of deterred school participation. One argument pertains to the heterogeneous quality of land which may necessitate the need for child labour (Cockburn 2000), whereas Bhalotra and Heady (2003) argue for a "wealth paradox". Their study from Pakistan and Ghana reveal lower school participation rates in better land-endowed households than in the land-poor households, and which they claim origins in imperfect markets for land and labour. Wealth and substitution effects pull in opposite direction since in the presence of labour market imperfections the farm households face greater incentives in employing own child labour, giving room for the latter effect, while the wealth effect pulls in the opposite direction. Shimamura and Lastarria-Cornhiel (2010) report similar findings, more land endowments increase the probability for using child labour in crop production in Malawi and which may occur at the expense of schooling.

Chernichovsky (1985), on the other hand, argues that relatively fixed land endowments give diminishing returns to labour, thereby decreasing opportunity costs related to sending children to school. Contrary to this, Malawian smallholders are found to be labour constrained despite high

labour-land ratios (Alwang & Siegel 1999). Again the explanation lies in thin and imperfect markets whereby households with few liquid assets forced to divert labour resources to other income-generating activities, either in response to shocks or to relax liquidity or credit constraints. In Malawi especially boys' time is diverted from school to working as casual labour (*ganyu*) in order to relieve the pressure of liquidity constraints according to a study cited by Kadzamira and Rose (2003).

Alternative endowments include livestock and housing. Livestock endowments and school participation is found to show a similar pattern as land, whereby smaller livestock requiring herding may induce a negative relationship between these endowments and children's school participation (Cockburn & Dostie 2007). In order to avoid the problem of contrasting wealth and substitution effects a recent study uses housing quality to reflect household living standards, and argue that is a more appropriate proxy for wealth (Nkamleu 2006). However, the housing market being more or less nonexistent in Malawi (Morris et al. 2000), may question the ability of relieving credit constraints. On the other hand, it may be more appropriate to use than land or livestock since there are no substitution effects involved.

3.4.3 Parental education and employment

Educational attainment by household heads is argued for as important in affecting the school participation. Better educated parents may assign greater value to education and thereby extend children's presence in school (Amin et al. 2006). Others pinpoint the positive side-effects higher parental education level may provide in terms of job contacts (Brown & Park 2002). Although closely linked with parental preferences studies have repeatedly focused on the positive impacts that additional school years by female heads generate, in terms of entry age, school progress and completion rates (Schultz 2002); and Shimamura and Lastarria-Cornhiel's (2010) study on school attendance in Malawi confirms this trend.

Similarly, employment strategies by household head and spouse may affect the school participation. Self-employment in agriculture or informal work increases the opportunity costs related to school attendance since child labour is an alternative to hiring in (Arunatilake 2006; Canagarajah & Coulombe 1997). Otañez et al. (2006) notes especially the importance of child

labour in the Malawian tobacco economy. Conversely, employment in formal work may contribute to greater understanding of the value of education, but also provide greater financial security (Huisman & Smits 2009). However, parent's employment strategies may affect children differently. Nankhuni and Findeis (2004) note that when adult females are engaged in out-of-house activities the younger girls are forced to act as substitutes. Similarly, credit program participation by adult females is found to reduce girls' school attendance in Malawi suggesting closer substitution effects in terms of same gender (Shimamura & Lastarria-Cornhiel 2010). Consequently, parental employment can both positively influence and constraint the school participation.

3.4.4 Shocks

The school participation is also found to be susceptible to shocks, and which may be closely linked with the above characteristics and endowments. Ending investments in human capital is identified as a response to negative income shocks among the chronically poor (Jacoby & Skoufias 1997). The available technology for household production, determined in part by access to substitutes, combined with parental preference structure and the opportunity cost of individuals' time affects who is withdrawn from school in face of both positive and negative shocks (Rosenzweig 1986). The HIV/AIDS epidemic exemplifies this. Household chores traditionally being within the realm of females, the epidemic has contributed to withdrawal of girls from school as the burden of household chores increases (Kadzamira & Rose 2003). Moreover, certain households respond by reducing household size by marring off girls early according to studies cited by Munthali (2002). A vicious circle emerges, whereby withdrawal of children as a response to shock may have inter-generational effects on future capacity to escape poverty .

3.5 Bargaining power

Combining parents' preferences with returns to education and ability to pay for schooling we re-enter the actual decision-maker, the household. Decision outcomes are the result of internal bargaining which again depends on each party's bargaining power. Quisumbing and Maluccio (2000) identify four determinants of bargaining power: resource control, ability to mobilize interpersonal contact, individual attributes and "influences that can be used to influence the

bargaining process" (Quisumbing & Maluccio 2000:17). A wide array of proxies have been introduced to capture bargaining power, and examples include asset ownership upon marriage, inherited assets, inherited land, present control of assets, income and difference in education level (Quisumbing & Maluccio 2000).

However, from bargaining power to decision outcome a bargaining process takes place which is affected by both internal and external factors. Especially education is argued for as influential in affecting the decision outcome (Quisumbing & Maluccio 2000; Quisumbing 2003). Frankenberg and Thomas (2001) argue that education of one parent is a reflection of relative bargaining power when controlling for the other parent's education. As previously noted parental education is asserted to affect children's schooling, and Estudillo et al. (2001) argue one can reveal gender-based preferential treatment based on parents' control of asset holdings and own education levels.

Moreover, external factors, such as the community, market and state interlock the bargaining positions and affect the available threat points (Agarwal 1994). Within the Malawian context the inheritance systems have been given special attention under the argument that it affects the wife and husband's bargaining power Lunduka et al. (2009). Moreover, the threat points for both parties is negatively affected when residing in the other spouse's village, since they essentially lack control over the land and in most cases have no rights in their maternal village. The credibility of threat points, such as divorce, therefore depends on both cultural norms and laws (Quisumbing & Maluccio 2000).

3.6 Outcome measures for schooling

The identification of a school outcome remains an issue, and the literature is fraught with diverse measures. A common measure is current school attendance, or regular school attendance as reported in the last semester (Shimamura & Lastarria-Cornhiel 2010); allowing for identification of determinants of school participation by use of Logit models (Jensen & Nielsen 1997). Glick and Sahn (2000) criticise the use of current enrolment as an outcome measure, arguing that it ignores the cumulative dynamic aspects as it treats schooling this year as independent of the school participation decision in previous years. Number of completed years of schooling, highest

grade completed, grade-for-age and drop-out has also been used (Amin et al. 2006). Determinants for delayed school attendance and drop-out rates has received increased attention after acknowledging that free education is not synonymous with higher levels of educational attainment (Moyi 2010). A number of measures capture delayed school progression, among them the School-for-age (SAGE) formula (Patrinos & Psacharopoulos 1995; Psacharopoulos & Yang 1991). The SAGE variable identifies individuals who are attending school but have had below normal progression due to class repetition or drop out, giving the formula:

$$SAGE = (\frac{S}{A - E})100$$

Where S is the number of schooling years, A is the individual's age and E is the official entry age at school in the country studied. Constructing a binary variable *overage* allows for differing between those who are delayed, *overage=1*, and those who are not, *overage=0* which is usually analysed by use of a Logit model (Patrinos & Psacharopoulos 1995). Patrinos and Psacharopolous (1995) also introduces the binary variable *drop-out*, which identifies individuals who have entered primary school, but dropped out as opposed to those who have completed or are still in school; and which they analyse the related determinants of using a Logit model. Unfortunately the quality of education is sidestepped by all these outcome measures, which is often a consequence of the restricted data available (Amin et al. 2006).

4. RESEARCH QUESTION AND HYPOTHESES

4.1 Research question and conceptual framework

Based on the premises identified in the literature review I seek to investigate the following:

> **What factors are associated with children's school participation, and do the factors differ by gender?**

Although not explicitly modelling the linkages between the external environment, internal bargaining power and its effect on investment in education, I present a conceptual framework in Figure 2, allowing for identification of indirect and direct effects based on the literature review.

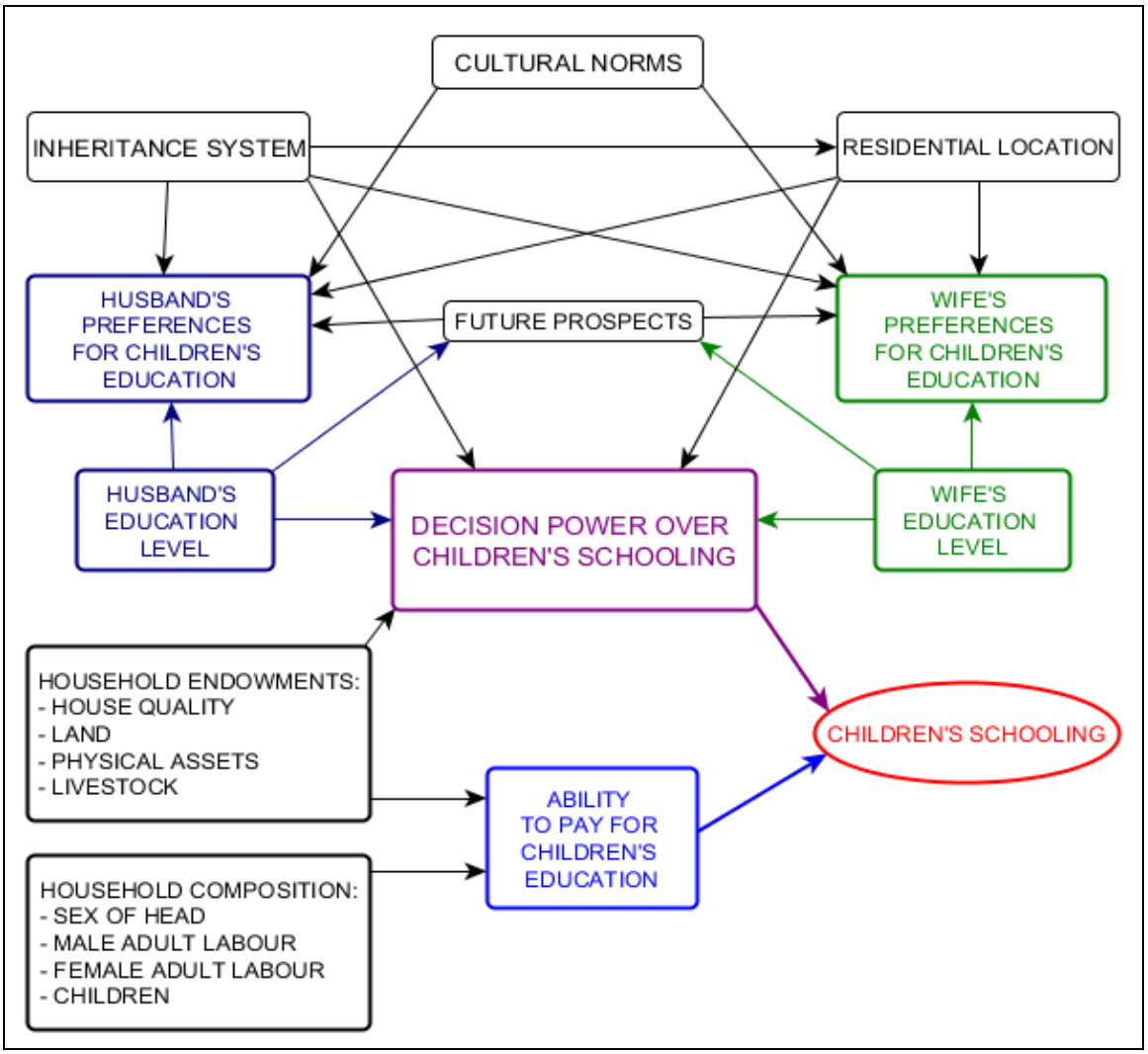

Figure 2: Conceptual framework for factors affecting school participation in rural Malawi

As seen from the conceptual framework in Figure 2 the focal point of analysis are the parents' positions within the household, also allowing for single-headed households. The internal household bargaining structure is assumed to be affected by a number of factors internal and external to the household. Decision power within the household is conditioned by parents' gender and education level, the external influence of inheritance system and residential location, as well as household composition. Children's schooling is the outcome of internal bargaining in the household based on the identified factors as well as constraints defined by household composition and endowments, the latter two affecting the ability to send children to school. Analysing factors associated with school participation demands focus on factors reducing the perceived costs or increasing the perceived benefits of sending children to school. Hypotheses are formulated based on a step-by-step approach moving from the internal to external factors as presented in the conceptual framework.

4.2 Hypotheses related to internal household characteristics

In the literature review I discussed the positive externalities that may arise as the result of parents' educational attainment, in a household setting that might refer to the household head and spouse. I therefore hypothesise that:

H 1a Mother's education is positively related to the school participation decision of both boys and girls, which also entails school progression and education level attained.

H1b Father's education is positively related to the school participation decision of both boys and girls, which also entails school progression and education level attained.

However, the conceptual framework identifies two paths of influence that may result in gender-based preferential treatment. First of all, preferences for investing in children may follow gender based parental altruism or gender egoism. Secondly, higher educational level by a parent allows for more decision power, and consequently imposing the preferences on the decision outcome. I therefore hypothesise that:

H2a Mother's education affects girls' education more than boys' education.

H2b Father's education affects boys' education more than girls' education.

On the other hand, a number of studies as referred to in the literature review, claim that mothers show greater preference for children and invest more in children than fathers. If this is the case, then the internal bargaining power would be expected to be larger for mothers when residing in female-headed households. I hypothesise that:

H3a Female heads positively affect the probability of attending school for both girls and boys, which also entails school progression and education level attained by both.

Parents' ability to follow up on preferences is largely defined by household composition and endowments as sending children to school and sustaining human capital accumulation is resource draining due to presence of both indirect and direct costs. Imperfect and missing markets increase the pressure on already scarce resources, and create an internal resource scarcity in terms of for example labour. Female-headed households[2] may face tighter labour constraints since a male head is not present, and presence of this labour constraint increases the opportunity cost of sending children to school. In such a setting school participation is affected by resource poverty giving room for the following hypothesis:

H3b Children residing in female-headed households are less likely to attend school than in male-headed households because they are poorer and less able to send children to school.

I use the three different outcome measures in testing hypotheses ***H1a-H3a*** in order to capture the multiple dimensions related to children's schooling. These outcome measures are: (1) probability of attending school on an annual basis, (2) probability of delayed school progression, using the binary *overage* variable based on the School-for-age formula, and (3) probability of dropping out

[2] The focus is restricted to female-headed households as the sample used provides less than ten incidences of single-headed households headed by a male.

of primary before completion. Next, I extend the resource poverty argument to other resource endowments. Using the first outcome measure only I will test the following hypotheses:

H4a Children residing in households with better house quality are more likely to attend school than children residing in households with worse house quality.

H4b Children residing in labour-rich households are more likely to attend school than in children residing in labour-poor households.

The latter hypothesis is investigated by differing between male and female adult labour and male and female young adult labour in order to allow for different effects. However, as seen from the conceptual framework the household composition affects the school participation decision through the internal bargaining power and ability to pay. In presence of labour constraints I expect a two-fold impact on school participation. Not only will children's school participation be constrained by lack of labour, but I postulate that the gender of labour lacking results in withdrawing child of same gender from school since greater substitutability is assumed than for the opposite gender, this given parental preferences formed by cultural norms. This is investigated through these hypotheses:

H4c Girls' school participation is positively related to the household's endowment of female labour.

H4d Boys' school participation is positively related to the household's endowment of male labour.

4.3 Hypotheses related to external factors

I have identified the external environment as being primarily the inheritance system and residential location. As shown in the conceptual framework I assume that inheritance system and residential location affect school participation through parents' preferences and decision power within the household. Difference in inheritance system may therefore have a two-way impact on the school participation. Firstly, women's bargaining power may be strengthened within a

matrilineal society. Secondly, the perceived future returns to education for girls may be greater. In matrilineal societies girls are presumed to inherit the land and the boys are to move upon marriage, while in patrilineal societies boys are the future beneficiaries and girls move to the husbands' villages upon marriage. In order to reap future benefits of investment the investment objective has to remain with the parents, therefore I expect a gender bias within each dominant inheritance system and if this affects the investment decision in human capital I would observe the following:

H5a Girls' schooling is more positively affected when residing matrilocally in matrilineal societies than when residing patrilocally in patrilineal societies.

H5b Boys' schooling is more positively affected when residing patrilocally in patrilineal societies than when residing matrilocally in matrilineal societies.

On the other hand, differences in residential location within each inheritance system may counteract the direction of preference given that the internal bargaining power is affected by residential location. According to Lunduka (2009) the residential location is strongly correlated with the party that brings the land into marriage, and as this brings more rights I expect a shift in internal bargaining power. I therefore postulate that the residential location affects the school participation, as a result of gender-based preferential treatment:

H6a Patrilocal residence within a predominantly matrilineal society is expected to negatively affect girls' schooling.

H6b Matrilocal residence within a predominantly patrilineal society is expected to negatively affect boys' schooling.

In order to inspect possible effects of residential location and inheritance system I use the delayed school progression variable *overage* based on School-for-age (SAGE) (Patrinos & Psacharopoulos 1995; Psacharopoulos & Yang 1991) as the dependent variable since this is more

likely to give a better picture of households' long-term cumulative investments rather than the static measure of annual school occupation.

Table 1 gives an overview of the hypotheses that I will investigate, the samples and dependent variables employed and the expected coefficient signs. School participation and school attendance are used interchangeably throughout the thesis, and encompass individuals whom the interviewee has reported as having school as the main occupation. All four models, the first three used investigating the internal characteristics, and the fourth focusing on external characteristics, and sample used are discussed in detail in Section 5.4.

Table 1: Issues, hypotheses to be tested and the samples and models used

		Model 1			**Model 2**			**Model 3**			**Model 4**	
Dependent variable		**Annual school participation**			**Delayed school progression: overage**			**Dropped out of primary**			**Delayed school progression: overage**	
Sample used		All years			Year 2009			All years			Year 2009	
		Age 4/6-19			Age 7-19			Age 11-19			Age 7-19	
		All	*Girls*	*Boys*	*All*	*Girls*	*Boys*	*All*	*Girls*	*Boys*	*Girls*	*Boys*
Parents' education and gender	***H1a***	+	+	+	+	+	+	-	-	-		
	H1b	+	+	+	+	+	+	-	-	-		
	H2a		+	**?**		+	**?**		-	**?**		
	H2b		**?**	+		**?**	+		**?**	-		
Female-headed household	***H3a***	+	+	+	+	+	+	-	-	-		
	H3b	-	-	-	-	-	-	+	+	+		
Poverty and gender	***H4a***	+	+	+								
	H4b	+	+	+								
	H4c		+									
	H4d			+								
Inheritance systems and residential location	***H5a***										+	
	H5b											+
	H6a										-	
	H6b											-

Signs indicate that the hypothesis is to be tested by use of model and sample indicated, and the nature of the sign indicates expected coefficient sign.

5. DATA AND METHODS

5.1 Data collection and description

5.1.1 Primary data

The primary data consists of an unbalanced panel, covering three time periods with data collection organised by Norwegian University of Life Sciences and Bunda College. Household surveys were conducted in the central and southern parts of Malawi in 2006, 2007 and 2009, with districts chosen based on difference in population density, major crops grown and proximity to urban centres. Households were chosen based on The 2004/2005 Integrated Household Survey's sample, where two to three Enumeration Areas were selected from each district, and within these thirty households were selected randomly (Lunduka 2009). All interviews were conducted in the local language Chichewa, and the survey took place after pre-testing of the questionnaire.

Data was gathered on household and village level. At household level we captured information of quantitative and qualitative nature, focusing mainly on household demographics and characteristics, including education levels and main occupations, land holdings, physical assets and livestock endowments, housing quality, sources of income, consumption expenditure, shocks experienced and the Farm Input Subsidy Program. Village discussions were conducted in order to determine general changes in the villages and access to basic services such as infrastructure, schools, clinics and markets. Appendix AII and AIII provide the questions used at household and village level in 2009. Ideally I would have information on school characteristics, unfortunately this has not been collected as schooling was not centred upon during field work. The main focus of this paper will be on household and individual member characteristics, school access and geographical and residential location.

5.1.2 Secondary data

Secondary data sources consist mainly of previous research on factors related to school participation, as discussed in the literature review, and on more Malawi-specific aspects that are important to the analysis. Furthermore, certain variables were constructed based on the primary data, some partly as a result of inconsistencies in questions posed. These variables are important to the analysis, and are discussed in detail here.

Adult male and female labour

Following Nankhuni and Findeis' (2003) acknowledgement of women working in general more hours than men, thus compensating for possible differences in muscle power, female labour is here assumed to equal that of male labour. Other studies underpins this (Government of Malawi & World Bank 2006), citing the average number of hours worked to be higher among females than males, although the latter spend on average more time on income-generating activities. The focal point of analysis being individuals within the age category 4-19, four different labour variables are constructed capturing the number of adult male and female labourers aged between 20-24 and 25-64 years old. Each individual equals one labour unit.

Housing quality

Housing quality is an important asset in the Malawian setting, and used to differ between poverty groups (Ellis et al. 2002). Furthermore, during focus group discussions improved housing quality was often stated as an important change in livelihood. When asked to categorise poor and less poor, the former group was described as having "not proper housing". However, using a monetary value of housing quality is inappropriate as the housing market in rural Malawi is more or less nonexistent (Morris et al. 2000). Instead an index for housing quality is created, combining features on roof, walls, floor and windows. A positive relationship between quality and number is assigned to each feature, and aggregated to a total *Quality of house* variable taking on values between four and fourteen.

Distance to schools

Access to schools was asked for during the focus group discussions conducted in 2007 and 2009. Using distance variables at village level may remove potential problems of endogeneity related to the individual reporting by households, although it fails to capture the travelling distance for households located far away from the village centre. Ability to estimate distance varies, and for some villages that were interviewed both in 2007 and 2009 the distance reported differed although the school itself had the same name. In these cases an average of the two distances reported is used. During data collection the schooling was not in focus, and therefore I fail to provide distances to the different types of secondary schools. Distance to community day secondary school (CDSS) was most commonly reported for, and the analysis uses this

information. Transport assets are rare in ownership, therefore distance to schools is assumed to be covered by foot for all.

5.1.3 Data weaknesses

The thesis rests primarily on primary data collected by students from Malawi, Ethiopia, Uganda and Norway in close cooperation with local enumerators. Although questionnaires were routinely checked after the interviews for inconsistencies, the data is of varying quality. This has had both implications for choice of thesis topic and room for investigation of hypotheses. As I will discuss below, certain hypotheses are investigated based on a restricted sample of observations from year 2009 only. Data has only been gathered on individuals currently present in the household, excluding family members that may have moved due to marriage, to continue education or in search of work. This excludes analysis on the effect of sibling order; instead I will focus on household members currently residing in the household.

Moreover, although I have attempted to identify individuals over time based on the member identification, member sex and age there may be problems in identifying the correct individual in cases such as where the household has reported a nick-name or the wrong age. Similarly, the school occupation and education level used for all individuals is based on the interviewees reporting, and the data gathered may therefore suffer from remembrance or mix-ups regarding the different children and the households heads themselves. Identification of children of the household head has posed some problems in a few cases where the same individual was reported with different relationships to the household head across the years. Use of the individual fixed-effects model, to be discussed below, will therefore not drop this variable as it is not time-invariant in all cases.

Data collection results in multiple and diverse problems; most important being that of missing or wrongly reported responses. In certain cases information lacked on key variables, and these household therefore had to be dropped. Ideally these missing answers have occurred randomly and will not influence the estimates, although of course this cannot be stated with certainty. A more serious issue pertain to the school participation variable. As I will discuss below, the validity of the variable across the years may be questionable. To my knowledge the children's

schooling has not been in focus during any of the field works and consequently the information gathered may be of varying quality.

5.2 Defining the outcome variables

5.2.1 Who attends school?

The official school age in Malawi is six to nineteen years old, where the first eight years are spent in primary school, and then continuing into secondary school for four years (Moyi 2010). In our sample a small but constant number of individuals are registered with schooling as their main occupation, despite being only four years old. Previous studies on school participation in Malawi have in general not noted early enrolment, but the lower age limit at six used in most studied samples may account for this (Grant 2008; Moyi 2010; Nankhuni & Findeis 2004; Shimamura & Lastarria-Cornhiel 2010). The explanation may lie in underreporting of age, either consciously or due to problems of remembrance causing misreporting, a suspected problem in neighbouring Mozambique (Wils 2004). On the other hand, the prevalence of cases indicate that certain children do in fact begin schooling at this age, and a recent report claims that 40% of five-year-olds have attended Standard 1 (World Bank 2010). This is further supported by Kholowa and Rose (2007), who note that the age of individuals attending Standard 1 can range from 3-18 years old. On the other hand, inclusion of these individuals may be inappropriate given the official school age and the related polices directed at children's schooling. I will therefore conduct analysis using lower age limits of four and six when appropriate.

The upper age limit for the sample is set at age 19. The probability of attending school, having school as ones main occupation, past the age of 20 years is highly unlikely in a developing country such a Malawi. Although I do observe some individuals in the sample continuing school past the age of nineteen the frequency is low and it is questionable how much the inclusion of these would add to the analysis. One may argue that their exclusion results in a very restrictive demographic household setup. Excluding them fails to acknowledge the few, but equally valid cases of households where parents and their grown up children live together, enabling the latter to continue schooling. On the other hand, including this group of individuals could result in sample selection bias related to migration (Mani et al. 2009) upon marriage, in search of work or to continue to higher levels of education. Furthermore, the focus being on the parents' role the

inclusion of individuals past the age nineteen would also include parents of newly established families, thereby biasing the results as these are not children whom parents have to make the school participation decision on behalf of. Based on the focal point of the analysis the number of households included is restricted to those who have one or more household members that fall within the age category 4 to 19 years old.

5.2.2 Measuring school participation

The three year panel offers data on "Number of years of schooling", "Highest education level completed" and "Main occupation" where "Schooling" is one of the alternatives. Our focal point of analysis demands use of the "Main occupation" variable, falling in line with Jensen and Nielsen's work (1997). On the other hand, current school enrolment, understood as main occupation, does not adequately reflect the level of education attained by an individual (Grant 2008). Unfortunately the variable "Number of years of school" poses a number of problems as it is only an indication of the number of years attending school, and does not capture the highest class attended. Delayed school progression is a common problem, therefore I cannot assume that number of school years equals highest class attended. Data from 2009 supports this, where we have an additional question on "Highest class attended".[3] The variable capturing age grade-distortions, *overage,* as defined by Patrinos and Psacharopoulos (1995), is therefore only investigated using data from 2009. An alternative outcome measure to main occupation is "Highest education level completed". Given the panel data's short nature one may question the applicability of such a measure. On the other hand, it serves as an identifier, differing between individuals who have attended school for many years and completed levels of education compared to those that haven't. This information is indirectly used in a constructed binary variable "dropped out of primary", and is investigated using a restricted age-group sample.

A crude cut is made between those who attend school and those who don't, failing to capture the degree of school attendance. The unspecified nature of schooling prevents more detailed analysis in differing between those who attend part-time, combining schooling with farming, and those who solely concentrate on schooling. I will not assume that school participation and work are

[3] I have to make a strong assumption here, claiming that "Highest class attended" is highest class completed. Data collection occurred at the end of the school year, supporting the reasoning that those who "attended" a class also completed.

mutually exclusive categories. Agriculture being labour intensive in developing countries, and combined with a large number of household chores, would indicate that most children regardless of whether they attend school or not have to perform certain chores. Moreover, treating the two as mutually exclusive would ignore a third alternative exists which falls into Edmonds' (2008) category of "idle children", those that neither attend school nor are reported as working. Keeping this in mind, I will proceed to investigate children's schooling.

5.3 Final data and descriptive statistics

The sample of households across the three year panel includes 1046 household observations, giving an unbalanced panel, after dropping household with missing answers and controlling for outliers. The analysis is done at an individual level, restricting the sample to individuals falling within the age category 4-19. The three year household panel provides 2945 observations on an individual level, and Table 2 reports individual characteristics by gender for those falling within the specified age category.

Table 2: Individual characteristics of girls and boys aged 4-19

Variables	Observations	Mean	Std. Dev.	Min	Max
Girls aged 4-19 years old					
Age	1416	10.44	4.42	4	19
Age squared	1416	128.43	99.38	4	361
Eldest child (dummy=1)	1416	.23	.42	0	1
Child of head (dummy=1)	1416	.78	.41	0	1
Main occupation is school (dummy=1)	1416	.66	.47	0	1
Number of school years	1416	3.10	2.77	0	13
Highest class attended*	448	3.05	2.70	0	12
Highest level of education completed^	1416	3.10	.63	0	4
Boys aged 4-19 years old					
Age	1529	11.01	4.31	4	19
Age squared	1529	139.83	98.51	16	361
Eldest child (dummy=1)	1529	.22	.41	0	1
Child of head (dummy=1)	1529	.79	.41	0	1
Main occupation is school (dummy=1)	1529	.70	.46	0	1
Number of school years	1529	3.27	2.84	0	15
Highest class attended*	484	3.31	2.89	0	13
Highest level of education completed^	1529	.34	.67	0	4

* Highest class attended was only asked in year 2009, therefore the lower number of observations
^Code for level of education: 1- Standard 1-4, 2- Standard 5-8, 3- Attended secondary, 4- Completed secondary: MSCE, 5- Technical College, 7- University

A lower number of observations is reported for the variable "Highest class attended" since this question was only posed in 2009. Still, it serves to show the mean difference between girls and boys and allows for investigating what factors affect probability of delayed school progression. Upon closer inspection I note that secondary school is the highest level of education completed, whereupon the Malawi School Certificate of Education is granted (UNESCO 2008). Given that all our households reside in rural areas, individuals who have continued to technical college and university are expected to have moved out. Consequently, the analysis is restricted to primary and secondary school. Characteristics at household level for households with one or more individuals aged 4-19 are compiled in appendix A1, collapsing the number of observations to 1046 observations on household level. I report there the mean education levels of the male head and female head/wife of the household. In order to clarify, throughout this analysis I will treat the education of the male head as that of the father of the children, and the education of the female head/wife as that of the mother since this is the most common household structure within the sample.

Before undertaking econometric analysis I take a closer look at the school participation as seen from the descriptive statistics. Figure 3 captures the number of school participants, with schooling as their main occupation, as share of total number of individuals for each age category and by gender.

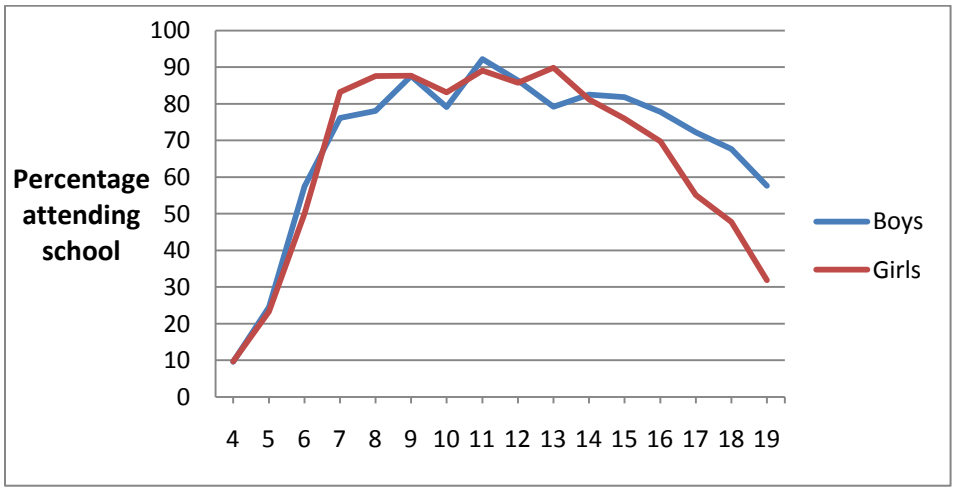

Figure 3: School participation rate by gender and age: Individuals aged 4-19: Total sample

Viewing the age groups regardless of gender the school participation rate peaks at age eleven, with the greatest bulk of school participants aged between seven and fourteen years old. Both

genders experience a sharp drop at age ten, increasing again at age eleven. Commencing school at age six and without retaking any classes would imply finishing junior primary school at nine, and children just having finished this level may be awaiting continuation into senior primary. Alternatively this could be a question of data weakness. Since the surveys have been conducted during school holidays following a terminated school year certain households have perhaps been uncertain about their children's future occupations. This is consistent with what is expected in the Malawian context, given the schooling system and eligible age groups.

Interesting observations are made in terms of gender. School participation is found to be higher among girls at age thirteen than among boys. Moreover, a larger percentage of girls at age seven and eight are attending school, which falls in line with previous findings from Malawi (Grant 2008). On the other hand, girls' school participation falls considerably from age fourteen while the boys experience a more gradual fall in attendance. The sharpest gender gap is observable for ages eighteen and nineteen where the school participation rate is more than 40% higher for boys.

School participation rates are high among adolescents, confirming previous studies' findings (Grant 2008; Shimamura & Lastarria-Cornhiel 2010). Notably, continuing schooling past age sixteen does not exclude participation in income-generating activities, nor does it imply almost completion of secondary school as the age might indicate. In fact, only 27.9% of the studying 15-19 year olds have completed primary school leaving a remaining 72% registered as studying in primary school. Also, as Figure 4 clearly indicates, albeit with a restricted sample of observations from year 2009, the average level of class attended among individuals older than fourteen reaches a maximum of Standard 8 for boys and Standard 7 for girls.

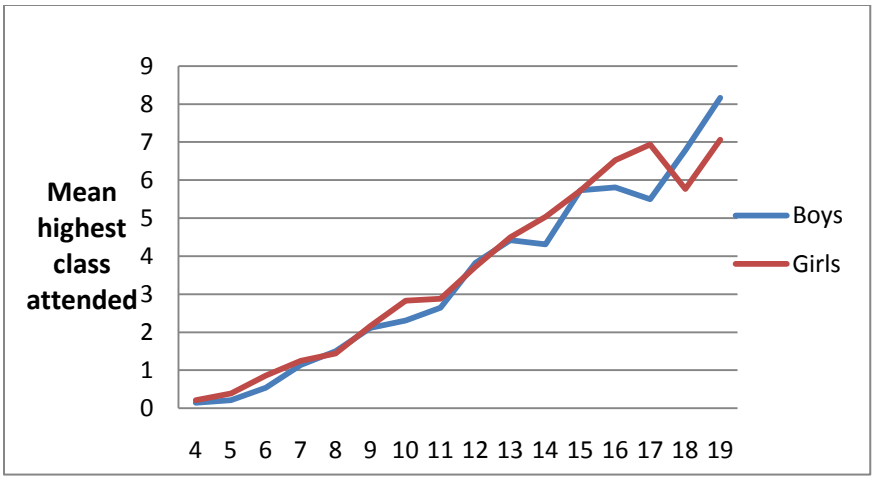

Figure 4: Mean highest class attended by age, individuals aged 4-19 years old: Year 2009

The gender gap among adolescents is not so prominent for "Highest class attended", as seen in Figure 4, compared to the school participation rate reported in Figure 3. One possible explanation pertains to the data used. Figure 4 employs data from 2009 only, while Figure 3 uses for all three years, and therefore changes across the years may have influenced the educational attainment reported. Another interpretation is that boys' school progress is slower, demanding longer periods in school than girls. Grant (2008) notes a possible connection between girls' higher participation rates at earlier ages, and falling participation compared to boys in the group of adolescents, whereby the latter can be explained by girls' progressing faster through school. A third, and more serious reason for why girls are observed as catching up is related to the sample of adolescents. There may be issues of sample selection bias related to this age category, as it is not uncommon for girls to marry early and which excludes continued education (World Bank 2010). Consequently, those who remain in the household may be more privileged in continuing their education, compared to those who have left, and thereby overestimating the average highest class attended for girls.

Figure 5 reports for completed primary school and attended secondary school for all three survey years, and it confirms that girls progress through primary school at a faster rate as seen for the age categories 14-16. However, at age seventeen the boys catch up and surpass the girls in terms of percentage who have completed primary for age groups eighteen and nineteen. Moreover, although few enter secondary at the expected age of fourteen, a higher percentage of boys are found to have entered secondary school past the age seventeen, as seen from the stippled lines.

Girls, on the other hand, stagnate at age sixteen whereby no more than 10% per age category have entered secondary school. A prevalent problem is clearly delayed school attendance and discontinuing participation, as confirmed by Figures 3-5. Evidently finishing secondary school at age nineteen is not the norm. Based on the sample of individuals age 7-19 the age-grade distortions are to be investigated more closely for year 2009 in Model 2 and 4.

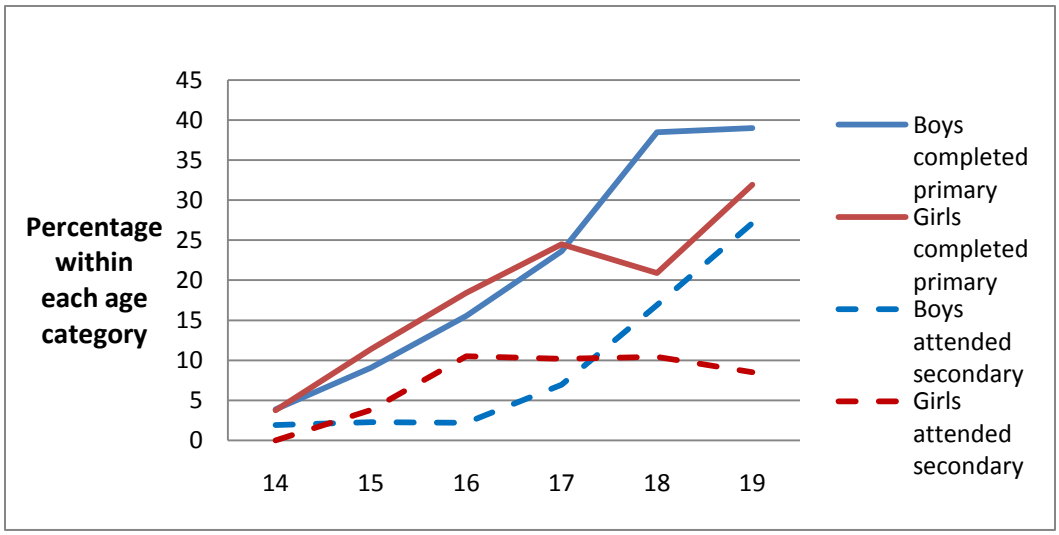

Figure 5: Primary school completion and secondary attendance by age groups and gender: Total sample

Moreover, annual differences are observable in terms of school participation. Subdividing school participation into yearly observations allows for observing possible trends over time and Figure 6 decomposes observations for children aged 4-19 years old into year of survey. A clear reduction in percentage of children attending school is observable for 2007. Percentagewise it is reduced from 2006 to 2007, and then a sharp increase into 2009. The yearly differences are not easily accounted for. Unfortunately I lack data for 2008 which might have contributed to explaining why there is such a sharp increase from 2007 to 2009 in school participation rates. The validity of this variable is clearly questionable, and I will therefore not solely base the analysis on annual school participation.

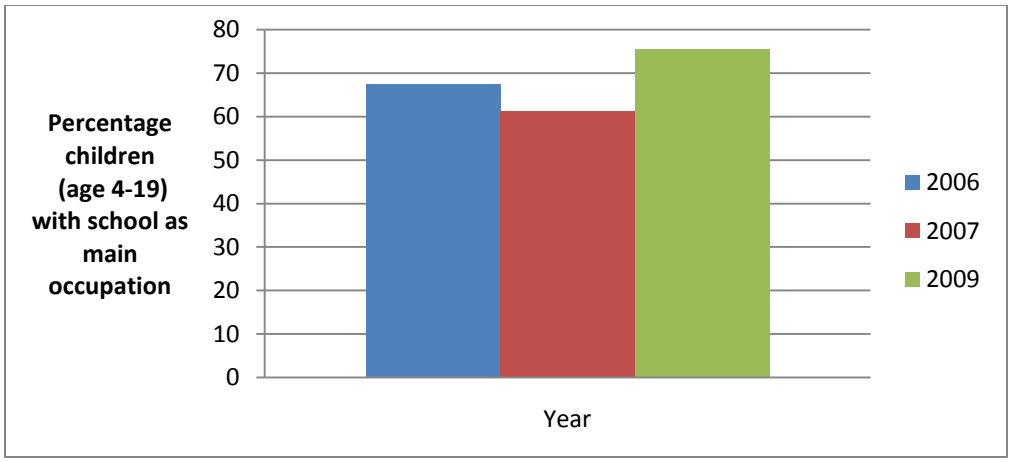

Figure 6: School participation by year for individuals aged 4-19 years old: All years

5.4 Methods

Access to panel data enables controlling for time-invariant observable and unobservable household and individual characteristics. Individuals are identified over time, enabling controlling for individual child fixed effects such as ability, genes and other observable and unobservable time-invariant factors. Moreover, panel data allows exploiting variation both across time and across individuals, which may give more efficient estimation. In order to ensure consistency of estimates, the school participation decision is investigated by the use of alternative panel methods. I use random- and fixed effects, the latter at both household and individual level, depending upon the issue discussed and sample available. Based on the direct and indirect factors identified in the conceptual framework and the stated hypotheses I will estimate the following four models using three school outcome measures.

5.4.1 Model 1: Factors associated with school participation

School participation, defined as having school as main occupation in the past year, is a binary variable. Logit models are used in estimating the probability of attending school or not for individuals in the age groups 4-19 and 6-19. Using the maximum likelihood estimator I estimate the household random-effects logit (1a), and with the conditional maximum likelihood estimator I estimate the conditional household fixed effects (1b) and conditional individual fixed effects (1c) models.

$$(1a)\quad S_{iht} = \alpha_{10} + \alpha_{11} I_{iht} + \alpha_{12} Z_{ht} + \alpha_{13} G_{ht} + u_{1h} + \varepsilon_{1iht}$$
$$(1b)\quad S_{iht} = \alpha_{10} + \alpha_{11} I_{iht} + \alpha_{12} Z_{ht} + \alpha_{13} G_{ht} + \lambda_{1h} + \varepsilon_{1iht}$$
$$(1c)\quad S_{iht} = \alpha_{10} + \alpha_{11} I_{iht} + \alpha_{12} Z_{ht} + \alpha_{13} G_{ht} + \lambda_{1i} + \varepsilon_{1iht}$$

Where S_{iht} = (0, 1) equal to 1 if individual *i* from household *h* has school as his/her main occupation in year *t*, equal to 0 if otherwise; and I_{iht} is a vector of observable individual characteristics in year *t*, such as child's gender and age. Z_{ht} is a vector of observable household characteristics in year *t*, which includes variables capturing education level of both parents, which I have hypothesized will have a positive effect on the probability of attending school. It also encompasses a variable for housing quality, and a number of variables pertaining to household composition such as sex of household head and variables capturing adult labour. G_{ht} is a vector of observable village characteristics in year *t*, more specifically the reported distances to primary and secondary school, and district dummies. ε_{1iht} are the time-varying random error terms, u_{1h} is the household-specific random effect (household random intercept), λ_{1h} is the household-specific fixed effect (household fixed intercept) and λ_{1i} is the individual-specific fixed effect (individual fixed intercept).

5.4.2 Model 2: Delayed school progression

Following Patrinos and Psacharopolous (1997) I use the School-for-age formula to identify the effect of parents' education and residing in a female-headed household on the probability of having delayed school progression. Estimation is conducted using a sample restricted to age category 7-19 years old. The lower age limit is set at seven since the official entry age in Malawi is age six and therefore all six year olds would be without a School-for-age value. Furthermore, I only use data from 2009 since the two previous survey years lack information on "Highest class attended". Some individuals began schooling prior to age six, and have therefore School-for-age values exceeding 100, and a number of individuals have never attended school despite falling within the school age category, thereby having a School-for-age value equal to 0. Based on the School-for-age (SAGE) values I generate a binary variable *overage* which is set equal to 1 if an individual has below normal school progression (SAGE<100), and set equal to 0 if the individual has normal, or above normal, school progression. Further, this allows for estimating by use of a Logit model:

$$(2)\quad overage_{ih} = \alpha_{20} + \alpha_{21} I_{ih} + \alpha_{22} Z_h + \alpha_{23} G_h + \varepsilon_{2ih}$$

Where $overage_{ih}$= (0, 1) equal to 1 if individual *i* from household *h* has a School-for-age value less than 100, implying delayed school progression, equal to 0 if otherwise. I_{ih} is a vector of observable individual characteristics in year 2009, Z_h is a vector of observable household characteristics in year 2009, G_h is a vector of observable village characteristics in year 2009 and $\varepsilon_{2ih}$is the random error term.

5.4.3 Model 3: Dropping out of primary school

Low completion rates in primary school remains an impediment to improved human capital levels in Malawi. Entering school is no longer the main problem, rather the ability to finance sustained presence (Kadzamira & Rose 2003). I therefore wish to investigate how parents' education and sex of household head affect the probability of dropping out of primary school. Based on Patrinos and Psacharopoulos' (1995) work I define a drop out as an individual with a positive number of schooling but that has dropped out before completing primary school, measured by Standards 1-8. Model 3 restricts the sample used to individuals aged 11-19, but includes observations from all three years. I set the lower age limit at eleven since previous studies indicate a prevalence of early drop outs (Maluwa-Banda 2004). The panel nature of the data allows use of household random effects logit (3a) and conditional household fixed effects logit (3b) models:[4]

$$\text{(3a)}\quad dropout_{iht} = \alpha_{30} + \alpha_{31} I_{iht} + \alpha_{32} Z_{ht} + \alpha_{33} G_{ht} + u_{3h} + \varepsilon_{3iht}$$

$$\text{(3b)}\quad dropout_{iht} = \alpha_{30} + \alpha_{31} I_{iht} + \alpha_{32} Z_{ht} + \alpha_{33} G_{ht} + \lambda_{3h} + \varepsilon_{3iht}$$

Where $dropout_{iht}$ = (0, 1) equal to 1 if individual *i* from household *h* has dropped out of primary school despite a positive number of schooling years in year *t*, equal to 0 if individual *i* from household *h* is still in school or has completed primary school in year *t*; I_{iht} is a vector of observable individual characteristics in year *t*; Z_{ht} is a vector of observable household characteristics in year *t*; G_{ht} is a vector of observable village characteristics in year *t*; ε_{3iht} are the time-varying random error terms; $u_{3h}$is the household-specific random effect (household random intercept) and $\lambda_{3h}$is the household-specific fixed effect (household fixed intercept).

[4] Using individual fixed effects would drop a substantial number of observations, including only those who re-enter or drop-out of primary, thereby giving little room for analysis.

5.4.4 Model 4: Delayed school progression given inheritance system and residential location

The last four hypotheses related to inheritance system and residential location are investigated by using *overage* as the dependent variable. Model 4 is therefore essentially the same as Model 2, except that I differ between dominant inheritance system and the residential location of the household, capturing these by use of interaction dummies. The model is estimated by use of Logit:

(4) $overage_{ih} = \alpha_{40} + \alpha_{41} I_{ih} + \alpha_{42} Z_h + \alpha_{43} G_h + \alpha_{44} D_{mmh} + \alpha_{45} D_{pmh} + \alpha_{46} D_{mph} + \varepsilon_{4ih}$

Where $overage_{ih}$= (0, 1) equal to 1 if individual *i* from household *h* has a School-for-age value less than 100, implying delayed school progression, equal to 0 if otherwise, implying normal school progression; I_{ih} is a vector of observable individual characteristics in year 2009; Z_h is a vector of observable household characteristics in year 2009; G_h is a vector of observable village characteristics in year 2009; D_{mmh} is a dummy set equal to 1 if household *h* is located in a matrilineal society and resides matrilocally, equal to 0 if otherwise; D_{pmh} is a dummy set equal to 1 if household *h* is located in a patrilineal society and resides matrilocally, equal to 0 if otherwise; D_{mph} is a dummy set equal to 1 if household *h* is located in a matrilineal society and resides patrilocally, equal to 0 if otherwise and $\varepsilon_{4ih}$is the random error term. The few households residing neo-locally are excluded from the analysis, and patrilocal residence in a patrilineal society is therefore the reference dummy. Residential location is identified based on households' reported residence, whereas dominant inheritance system is identified on a regional level where matrilineal is that the Southern Region and patrilineal are the districts in the Central Region.

5.4.5 Estimation issues

A number of distinctions pertain to the applicability and robustness of estimates in using random- and fixed effects. Fixed effects has the advantage of controlling for unobservable individual and household characteristics and allowing for the latter to be correlated with the explanatory variables. However, as noted by Jensen and Nielsen (1997) in their study on schooling in Zambia, the fixed effects also implies a number of disadvantages. Fixed effects restricts the sample of studied individuals to those with changing school participation, going

either from no participation to participation as maximum likelihood fails to estimate the intercept of individuals who have unchanging occupation (Kennedy 2008). The consequences of this are threefold: first of all a large number of individuals are excluded. Secondly, the model may suffer from biased estimates since it is likely to capture entries and exists primarily of the youngest and oldest individuals within the age category. Especially attrition bias may be a problem, since a substantial number of individuals, especially when using individual fixed effects, are dropped. Thirdly, time-invariant explanatory variables are dropped.

The alternative to fixed-effects is random effects which provides more efficient estimates, but only under the assumption that the unobservable heterogeneity is uncorrelated with the explanatory variables. Using random effects will render the estimates inconsistent if unobserved household or individual effects are found to be correlated with the explanatory variables. Consequently, there is a trade-off between robustness and efficiency in the fixed- and random effects estimation, as fixed effects is robust to endogenous individual-specific effects, but inefficient if the fixed effects are exogenous. Random effects is efficient, but not robust to correlation between the individual-specific effects, which are assumed to be part of the error term in this model, and the included explanatory variables (Wooldridge 2009). On the basis of this I therefore proceed with care in analysing the results.

6. RESULTS AND DISCUSSIONS

6.1 Factors associated with school participation

6.1.1 All children

The first model investigates factors associated with the probability of attending school as reported on an annual basis. Table 3 reports three Logit model estimations of Model 1 using sample of children aged 6-19 years old. I initially set out to analyse school participation for individuals from age four, but as seen from appendix A2 the inclusion of these individuals gave different results in terms of levels of significance for the main variables of interest as compared with using sample of individuals aged 6-19. As the official entry age is six years old the focal point of analysis centres on those aged 6-19. I therefore proceed by focusing on this age category.

As background for the following discussion I note that the dummy capturing sex of child, *Female child,* is not found to be statistically significant at 10% significance level or lower, and the same applies for the variables *Distance to primary school (km*) and *Distance to secondary school (km).* This suggests that dropping these variables in the fixed-effects models is not likely to affect the estimates as compared to the random-effects model. The district dummy for Lilongwe is an exception this, and which I will return to later. Nevertheless, I acknowledge that the chosen age limit may have affected the estimated coefficient on the gender variable as I am not treating adolescents and younger children separately.

Hypotheses ***1a*** and ***1b*** stated that mother's and father's education are positively related to children's schooling, and according to Table 3 I find variable evidence for this. Regardless of model estimated the variable *Education level of male head* is not statistically significant at 10% or lower. In other words, I find no supporting evidence for hypothesis ***1a***, where I stated that father's education is positively related to the probability of attending school. In the case of *Education of female head/wife* I observe a different result. The variable in question is statistically significant at 5% in the household random-effects model, indicating support to the stated hypothesis regarding mother's education being positively related to children' school participation, ***1a***.

Table 3: Logit models: To school or not to school: Individuals aged 6-19: All years			
Variables	**Household random effects**	**Household fixed effects**	**Individual fixed effects**
Child's age	**1.293*** **	**1.356*** **	**1.481*** **
	(0.111)	(0.121)	(0.270)
Child's age squared	**-0.056*** **	**-0.058*** **	**-0.067*** **
	(0.005)	(0.005)	(0.011)
Child of head (dummy =1 if child of head)	**0.656*** **	**0.547** **	1.419
	(0.205)	(0.263)	(1.062)
Female-headed household (dummy=1 if female)	-0.361	**-0.934***	-0.959
	(0.262)	(0.487)	(0.859)
Age of household head	0.047	**0.156** **	0.002
	(0.043)	(0.069)	(0.108)
Age of household head squared	-0.000	**-0.002** **	-0.000
	(0.000)	(0.001)	(0.001)
Education level male head^	0.136	-0.115	-0.147
	(0.103)	(0.197)	(0.267)
Education level female head/wife^	**0.316** **	0.256	0.740
	(0.140)	(0.252)	(0.480)
Adult male labour (age 25-64)	-0.215	**-0.570** **	-0.574
	(0.199)	(0.290)	(0.388)
Adult female labour (age 25-64)	0.068	0.137	**0.734***
	(0.191)	(0.249)	(0.392)
Young adult males (age 20-24)	**-0.365** **	**-0.392***	-0.363
	(0.163)	(0.221)	(0.323)
Young adult females (age 20-24)	**-0.488*** **	**-0.697*** **	**-0.511** **
	(0.167)	(0.209)	(0.256)
Adolescents aged 15-19	**0.305*** **	**0.560*** **	**0.640*** **
	(0.117)	(0.141)	(0.203)
Children aged 6-14	**-0.127***	**-0.340*** **	**-0.355** **
	(0.073)	(0.110)	(0.176)
Children under age 6	-0.083	**-0.281** **	**-0.541*** **
	(0.087)	(0.122)	(0.192)
Quality of house index	**0.130*** **	0.034	0.078
	(0.031)	(0.044)	(0.059)
Year 2007 (dummy=1)	**-0.592*** **	**-0.676*** **	**-0.419** **
	(0.140)	(0.153)	(0.203)
Year 2009 (dummy=1)	**0.555*** **	**0.489*** **	**0.868*** **
	(0.158)	(0.178)	(0.315)
Lilongwe District (dummy=1)	**-1.306** **		
	(0.634)		
Constant	-7.011***		
	(1.151)		
Lnsig2u Constant	0.524***		
	(0.175)		
Wald χ^2,	258.223		
Wald degrees of freedom	28		
LR χ^2		254.111	112.744
LR degrees of freedom		20	19
Prob.> χ^2	0.000	0.000	0.000

Log likelihood	-1111.466	-530.840	-160.968
Number of observations	2528	1614	604

*Significant at 10% **Significant at 5% ***Significant at 1%. Standard errors reported in parentheses.
^Code for level of education: 1- Standard 1-4, 2- Standard 5-8, 3- Attended secondary, 4- Completed secondary, MSCE, 5-Technical College, 7-University. Dependent variable: 1=individual has school as main occupation, 0=individual does not have school as main occupation. Not reported but included variables: *Female child (dummy=1), Eldest child (dummy=1), Distance primary school (km), Distance secondary school (km)* and four district dummies (Thyolo as reference dummy) – none were statistically significant at 10% or lower.

However, controlling for household- and individual fixed effects I find no evidence supporting hypotheses ***1a*** and ***1b***. The fixed effects models removes possible correlation between unobserved effects and the explanatory variables, such as family genes and ability; and controlling for unobserved heterogeneity at household- and individual level seems to redeem both parents' education as not having statistically significant positive effects on the probability of attending school. Notably the individual fixed effects estimation uses a restricted sample of individuals, excluding all with unchanging school occupation, while household fixed effects excludes all households where individuals throughout the panel remain in or out of school. This may have important consequences for the estimates since parents who keep all their children, within the specified age category, in school may also be the ones who are better educated.

The ability to draw any general conclusions regarding hypothesis ***1a-1b*** is therefore questionable. If I assume that neither household specific effects are unlikely to be correlated with any of the included explanatory variables, then I find support for hypothesis ***1a***, regarding the mother, while no evidence regarding the father, ***1b***. If the random effects model provides unbiased estimates, the fixed-effects model will also be unbiased, but with larger standard errors giving less efficient estimation. On the other hand, it is not unlikely that parents' ability is correlated with some of the explanatory variables such as parents' level of educations and housing quality, consequently biasing the results. Similarly, unobserved heterogeneity at the individual level, such as a child's ability and interest in schooling may be correlate with who is still present in the household among the adolescents.

The results regarding residing in a female-headed household also require careful interpretation. Using household fixed effects I find that *Female-headed household* has a statistically significant negative coefficient, albeit only at 10%, which suggests a rejection of hypothesis ***3a*** and lends support to hypothesis ***3b***. The negative coefficient on the same variable throughout all model

estimations, although not statistically significant in two of three estimations, may imply an overall indication whereby female-headed households' ability to finance schooling or keep children in school may be limited in the face of binding constraints. Another aspect that may explain the negative coefficient indicated in the household fixed effects model is change in sex of household head due to divorce or death of husband. This would in most cases render a household more vulnerable as the male head is often an important bread-winner. Whether or not females exhibit stronger preferences for investing in children, as stated in hypothesis ***3a***, is not decipherable. In other words, I am only asserting that the results seem to indicate an acceptance of hypothesis ***3b***, as based on the household fixed effects model, whereby presence of resource constraints is inhibiting school participation by children in female-headed households.

Moving on to the "too poor to school" hypothesis, ***4a***, I observe that the household random effects supports this. Individuals residing in households with higher levels of housing quality, as measured by the constructed index *Quality of house*, have a higher probability of attending school. Again, the lack of statistical significance in the fixed-effects estimation could be accountable to the restricted sample used whereby less poor households, as defined by housing quality, are better apt at keeping their children in school throughout the survey period while children residing in the poorest households might never have entered in the first place. The individuals included when controlling for household fixed effects may therefore be individuals who for other reasons than poverty enrolled late or were forced to leave school. On the other hand, Moyi (2010) claimed that socioeconomic characteristics is one of main determinants for on-time enrolment. Alternatively, the unobservable household fixed-effects are correlated with the explanatory variables, and when controlling for these time-invariant effects housing quality no longer affects school participation. The fixed-effects results indicate in other words that poverty is not an impediment in sending children to school. Another likely explanation pertains to changes in housing quality. The panel period being relatively short, improvements or changes in house quality may be rare for many households, explaining why the variable is not statistical significant at 10% or lower in the fixed-effects estimations.

I postulated in hypothesis ***4b*** that households with more adult labour are more likely to send children to school since they are expected to face lower opportunity costs in sending children to

school as the need for substitutes in undertaking household chores or work in the field is reduced. In order to allow for gender effects I divided the labour force into male and female, and differed by age categories giving in total four adult labour variables. An immediate finding pertains to presence of young adult labour, regardless of gender. Both *Young adult females (age 20-24)* and *Young adult males (age 20-24)* are reported with statistically significant negative coefficients throughout, only exception being for young males in the individual fixed effects model. This suggests that presence of young adults impedes children's school attendance, reducing their probability of attending, and which may be accrued to internal resource competition. Individuals are found to progress through school at a slow rate in Malawi, possibly accounting for why the presence of young adults reduces the likelihood of younger children attending. Interestingly this effect seems to be stronger for *Young adult females (age 20-24)*, as indicated by the levels of statistical significance at 1-5%, compared to *Young adult males (age 20-24)* at 5-10%, contrasting previous findings of presence of older females having a positive effect on children's school participation (Glick & Sahn 2000).

In terms of adult labour the results are less conclusive. The variable *Adult male labour (age 25-64)* is only significant in the household fixed effects model, at 5%, but the negative coefficient suggests that the presence of more adult male labour reduces the probability of attending. This contrasts hypothesis ***4b***, where I stated that children's school participation is more likely in labour-rich households than in labour-poor households due to presence of labour constraints in the latter group. Possibly the inclusion of a squared term would have allowed for a non-linear relationship between adult male labour and the likelihood for children attending school whereby "too few" adult males in the household constrains the school participation. In terms of female labour the variable *Adult female labour (age 25-64)* is statistically significant with a positive coefficient in the individual fixed-effects only. As already discussed I cannot draw any general conclusions based on the sample used there, but I pinpoint that the variable, although not statistically significant at 10% or lower, maintains a positive coefficient sign in the two other estimated models as well. Although the results are weak empirically this suggestion a rejection of the labour-poor hypothesis, ***4b***, in terms of adult male labour, while in terms of adult female labour the results are uncertain.

Notably I have excluded adolescents from the work force categories in order to allow for separate effects, and as seen from Table 3 the variable *Number of adolescents aged 15-19* exhibits a statistically significant positive coefficient throughout (at 1%). This indicates that the presence of more adolescents aged 15-19 increases the probability of attending school. A possible explanation lies in economies of scales whereby older siblings guide younger children to school and in their homework (Bommier & Lambert 2000) or share tasks between themselves. Alternatively, as indicated by the coefficient signs on the statistically significant variables *Child's age* and *Child's age squared*, the adolescents undertake household chores or partake in income-generating activities thereby allowing the younger children to attend school. This would suggest that older siblings step in as substitutes for parents, contrasting the behaviour of young adults.

As noted earlier the district dummy Lilongwe is statistically significant, with a negative sign, in the household random-effects model. This indicates a reduced probability for attending school for children residing in the district of Lilongwe, as opposed to the reference district Thyolo. The sampled villages in the district of Lilongwe lie within close proximity of the capital Lilongwe. The off-farm labour market is expected to provide more diverse opportunities as opposed to the primarily tea-growing district of Thyolo. Possibly households residing in Lilongwe face a higher opportunity cost in sending children to school, and whereby children are sent into the labour market at an earlier stage. In terms of yearly differences the results indicate a higher probability for attending school in 2006 compared to 2007, while likelihood of attending increases in year 2009, relative to 2006. Why there are such strong differences across the years is less uncertain, and I acknowledge that there may be problems of measurement error involved.

6.1.2 By gender

Separating the sample by gender allows for further investigation into parents' influence and the different constraints that boys' and girls' school participation may face. I claimed in hypotheses ***1a-1b*** that educations of mother and father are positively related to children's schooling. According to the results reported in Table 4 I find some support regarding mothers' positive effect on both genders. *Education level of female head/wife* is statistically significant when controlling for household random-effects using girls' sample only and individual fixed-effects

when using boys' sample, both cases with a positive coefficient sign. *Education level of male head*, on the other hand, is only statistically significant at 10% or lower when controlling for household random-effects using girls' sample. This indicates support for hypothesis ***1b*** in terms of fathers' education being positively related to girls' school participation, whereas the effect on boys is uncertain. Comparing this with hypotheses ***2a-2b***, which state that parents give special preference to children of same sex as themselves, would thereby indicate a rejection of both.

Given that the random-effects estimates are not inconsistent, the results from Table 4 suggest that girls' school attendance is more probable as parents' own level of education improves. Better educated parents are perhaps less affected by cultural norms that place girls in an inferior position, instead assigning greater value to educational attainment. Note that this does not assert a negative effect on boys' school participation, it simply indicates that there is no statistically significant effect of education levels of household heads and spouses on the probability of boys attending school. The exception here being when controlling for individual fixed-effects, when better educated mothers positively affect the decision outcome on boys' schooling. The different samples employed makes it difficult to compare the results, but it does question the validity of hypothesis ***2a*** regarding mothers giving preferential treatment to girls. Regarding gender-based preferential treatment on behalf of the father, hypothesis ***2b***, I find reason to reject it.

However, I should be careful in concluding, as controlling for unobserved heterogeneity using random- and fixed-effects does not allow for reaching the same conclusions. Either the random-effects specification gives inconsistent estimates due to correlation between unobserved heterogeneity and explanatory variables, thereby possibly overestimating the effect of *Education of female head/wife* and *Education of male head*. Alternatively I may be observing different forces at work given the restricted sample used in the fixed-effects specifications. Moreover, although not statistically significant, the variable *Education of male head* in the household- and individual fixed-effects when using girls' sample even indicates a negative sign. Possibly a larger sample or using difference in education level would have been more appropriate in order to ascertain a clear effect.

Table 4: Logit models: To school or not to school: Individuals aged 6-19: All years: By gender

Variables	Household random effects		Household fixed effects		Individual fixed effects	
	Girls	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**
Child's age	**1.474*** **	**1.175*** **	**1.510*** **	**1.374*** **	**1.476*** **	**1.699*** **
	(0.155)	(0.166)	(0.198)	(0.200)	(0.384)	(0.415)
Child's age squared	**-0.065*** **	**-0.049*** **	**-0.066*** **	**-0.056*** **	**-0.065*** **	**-0.077*** **
	(0.006)	(0.007)	(0.008)	(0.008)	(0.016)	(0.017)
Eldest child (dummy=1)	0.263	0.135	**0.642***	-0.015	0.268	-0.267
	(0.237)	(0.262)	(0.363)	(0.300)	(0.805)	(0.602)
Child of head (dummy=1)	**0.601** **	**0.599***	-0.002	**0.742***	0.360	1.448
	(0.250)	(0.306)	(0.466)	(0.426)	(2.640)	(1.559)
Female-headed household (dummy=1)	0.107	**-0.762** **	**-2.094** **	0.068	-2.158	0.846
	(0.314)	(0.365)	(0.951)	(0.751)	(1.936)	(1.259)
Education male head^	**0.222** **	0.125	-0.565	0.135	-0.121	0.109
	(0.108)	(0.146)	(0.419)	(0.261)	(0.583)	(0.307)
Education female head/wife^	**0.512*** **	0.181	0.689	0.384	1.093	**1.232***
	(0.162)	(0.194)	(0.594)	(0.371)	(0.940)	(0.674)
Young adult males (age 20-24)	-0.037	**-0.393***	0.114	**-0.663** **	-0.025	-0.567
	(0.199)	(0.227)	(0.371)	(0.331)	(0.526)	(0.464)
Young adult females (age 20-24)	**-0.749*** **	-0.276	**-1.081*** **	-0.317	**-0.716***	-0.190
	(0.215)	(0.237)	(0.335)	(0.322)	(0.427)	(0.372)
Adolescents aged 15-19	0.203	**0.337** **	**0.451** **	**0.742*** **	0.392	**1.033*** **
	(0.143)	(0.168)	(0.208)	(0.227)	(0.332)	(0.310)
Children aged 6-14	-0.003	**-0.232** **	-0.268	**-0.503*** **	-0.080	**-0.618** **
	(0.082)	(0.107)	(0.172)	(0.192)	(0.312)	(0.244)
Children under age 6	0.014	-0.114	-0.275	**-0.367***	**-0.419***	**-0.904*** **
	(0.104)	(0.123)	(0.186)	(0.212)	(0.255)	(0.332)
Quality of house	**0.092** **	**0.183*** **	-0.025	**0.124***	0.019	**0.145***
	(0.037)	(0.044)	(0.071)	(0.065)	(0.097)	(0.080)
Year 2007	**-0.554*** **	**-0.604*** **	**-0.904*** **	**-0.569** **	**-0.666** **	-0.261
	(0.193)	(0.205)	(0.246)	(0.232)	(0.321)	(0.309)
Year 2009	**0.750*** **	0.294	**0.573***	0.255	**0.933***	0.766
	(0.219)	(0.226)	(0.293)	(0.259)	(0.487)	(0.488)
Lilongwe District (dummy=1)	-0.790	**-1.695***				
	(0.629)	(0.879)				
Constant	-8.698***	-4.917***				
	(1.402)	(1.651)				
lnsig2u Constant	-0.811	0.898***				
	(0.561)	(0.205)				
Wald $\chi 2$	168.78	102.38				
Wald degrees of freedom	26	26				
LR χ^2			134.944	92.001	68.676	59.187
LR degrees of freedom			19	19	19	19
Log likelihood	-528.465	-579.153	-185.309	-204.166	-69.937	-83.471
Prob. > χ^2	0.000	0.000	0.000	0.000	0.000	0.000
Number of observations	1199	1329	634	631	290	314

*Significant at 10% **Significant at 5% ***Significant at 1%. Standard errors reported in parentheses.
^Code for level of education: 1- Standard.1-4, 2- Standard 5-8, 3- Attended secondary. 4- MSCE, 5-Technical College, 7-University. Dependent variable: 1=individual has school as main occupation, 0=individual does not have school as main occupation. Not reported but included variables: *Adult male labour (age 25-64), Adult female labour (age 25-64), Distance primary school (km), Distance secondary school (km)* and four district dummies (Tholo as reference dummy) – none were statistically significant at 10% or lower.

I postulated two contrasting hypotheses regarding sex of household head. According to Table 4 the variable *Female-headed household* is only statistically significant (at 10% or lower) when using the household random-effects model in the case of boys, and household fixed-effects when using girls' sample. In both cases the coefficient indicates a negative sign. This suggest rejecting hypothesis ***3a***, where I claimed that female heads positively affect the probability of boys and girls attending school, and favours hypothesis ***3b***, where I stated that female-headed households are more resource constrained and therefore reduce the probability of attending school. This holds particularly in the case of girls, if the estimates obtained using random effects are in fact inconsistent. Moreover, the nature of the household fixed-effects model could imply that girls' school participation especially is vulnerable to a change in sex of household head. I do not seem to find evidence of gender-bias based on female heads behaviour as both girls' and boys' likelihood of schooling is negatively affected by residing in a female-headed household.

Returning to the poverty hypothesis, ***4a***, I note that school participation of both genders is positively related to housing quality. As seen from Table 4 this holds particularly for boys, as the variable *Quality of house* is statistically significant with a positive coefficient throughout. In the case of girls I find no statistically significant effect on *Quality of house* when controlling for neither household- nor individual fixed-effects, which would suggest that boys' school participation is more vulnerable to binding resource constraints, given that housing quality adequately reflects a households' poverty level. Alternatively, sample-specific factors are at play. As already discussed the individual fixed-effects specification excludes individuals always in school or never in school. The individual fixed-effects estimation may therefore indicate that in the case of a relieved resource constraint the parents are more likely to send boys to school rather than girls, thereby excluding the girls from the analysis. Unfortunately these are only speculations, but one should keep in mind the potential problems related to the usage of fixed-effects although it has the advantage of controlling for unobserved heterogeneity at individual and household levels.

Next I review the hypotheses regarding labour constraints, ***4b-d***. Neither girls' nor boys' probability of attending school seems to be affected by the presence of male and female adult labour (age 25-64) as neither variable is statistically significant at 10% or lower. However, I do observe gender-based labour effects when studying young adults. The variable *Young adult females (age 20-24)* is throughout statistically significant with a negative coefficient when studying girls alone, while *Young adult males (age 20-24)* shows a similar trend when using boys' sample. This signifies that same gender-based labour constraints do not inhibit school participation as I postulated in hypotheses ***4c-d***, rather presence of more young adults of same gender reduces the probability of attending school among children. A possible explanation pertains to off-farm work. Young adult males may acquire a better wage in the labour market, perhaps requiring younger boys to participate in on-farm activities and thereby preventing them from attending school. Same could apply for young adult females, forcing younger girls to withdraw from school in order to undertake household chores. Nevertheless, the results suggest a rejection of ***4b*** as more adult labour has a negative effect throughout, although for adults the results are inconclusive. The hypotheses regarding gender-based labour constraints, ***4c-d***, are uncertain for adult labour and not supported for young adults, although a gender dimension prevails.

Related to off-farm work is that of the district dummy for Lilongwe, *Lilongwe District*. It is the only statistically significant district dummy in the household random-effects model, and this so when using boys' sample only. The capital of Malawi is in close proximity to the surveyed villages in this district, and consequently also the possibility of off-farm work. Possibly the opportunity cost of having boys in school is too high relative to the wage obtainable in the labour market, causing households to withdraw the boys from school in order to participate. This effect is not statically significant for girls, although the coefficient sign suggests a similar relationship.

In terms of yearly differences, the probability of attending school is lower in 2007 for both girls and boys, as compared to 2006; although when controlling for correlation between explanatory variables and unobserved heterogeneity the level of significance is considerably lower. Then again, this could be due to the reduced number of observations used in the fixed-effects models. The negative effect of year 2007 is difficult to decipher, but one factor may be the introduction

of subsidized fertilizer for tobacco production in 2007 (Holden & Lunduka 2010). As noted earlier child labour is extensively used in tobacco production (Otañez et al. 2006) and this may have reduced the school attendance. However, the district dummy for Kasungu, a tobacco-growing district, is not found to be statistically significant thereby questioning the validity of this argument. Girls' school participation is furthermore positively affected in year 2009, as compared to year 2006. Possibly local improvements in the school offer have occurred. In the worst case, the prominent effect of the year dummies could signify wrongly reported values for the dependent variable.

6.2 Delayed school progression

So far I have focused on school participation as measured on an annual basis. Education is a long term investment and requires continued maintenance in order to finalise an educational level. I therefore proceed by analysing the probability of having delayed school progression. The dependent variable *overage* is set equal to 1 if an individual has delayed school progression, and set equal to 0 if not. Table 5 reports results from Logit models using the same set of explanatory variables as in Model 1.

Focusing on school progression allows reviewing the relationship between parents' education and children's schooling, and according to Table 5 additional support is given to both hypotheses ***1a-b*** when viewing all children together. The variables *Education level of female head/wife* and *Education level of male head* are statistically significant (at 1-5%) and with negative coefficients when using the sample of all children; which would suggest that children's school progression is positively related to both mothers' and fathers' education levels. Better educated parents give increased value to children's schooling, and both parents are able to influence the decision outcome through their own education levels. Interestingly the *Female child* dummy is not statistically significant, although it has a negative coefficient sign suggesting that girls are more likely to be delayed in their school progression.

Table 5: Logit models: Delayed (=1) or normal (=0) school progression: Individuals aged 7-19: Year 2009

Variables	ALL	GIRLS	BOYS
Female child (dummy=1 if female)	-0.152		
	(0.225)		
Age	**1.749*** **	**1.702*** **	**2.140*** **
	(0.275)	(0.374)	(0.461)
Age squared	**-0.052*** **	**-0.049*** **	**-0.067*** **
	(0.011)	(0.014)	(0.018)
Female-headed household (dummy=1)	0.243	**1.573***	-0.375
	(0.517)	(0.850)	(0.576)
Age of household head	-0.093	**-0.172***	-0.058
	(0.067)	(0.093)	(0.090)
Age of household head squared	0.001	**0.002***	0.000
	(0.001)	(0.001)	(0.001)
Education level male head^	**-0.321** **	-0.135	**-0.600*** **
	(0.135)	(0.219)	(0.178)
Education level female head/wife^	**-0.440*** **	**-0.626** **	-0.259
	(0.162)	(0.253)	(0.205)
Adult male labour (age 25-64)	0.677	**1.820** **	0.392
	(0.481)	(0.805)	(0.528)
Adult female labour (age 25-64)	**0.660***	0.449	**0.938** **
	(0.342)	(0.377)	(0.472)
Quality of house	**-0.149*** **	-0.100	**-0.203*** **
	(0.054)	(0.072)	(0.072)
Distance primary school (km)	0.091	**0.399***	-0.242
	(0.164)	(0.230)	(0.237)
Constant	-8.190***	-7.431***	-11.133***
	(2.109)	(2.818)	(3.099)
Log Likelihood	-250.241	-125.028	-112.838
Wald $\chi 2$	196.059	146.095	100.052
Wald degrees of freedom	25	24	24
Prob.> $\chi 2$	0.000	0.000	0.000
Pseudo R^2	0.3536	0.3608	0.4038
Number of observations	733	344	389

*Significant at 10% **Significant at 5% ***Significant at 1%.
Standard errors corrected for clustering at household level reported in parentheses. Code for level of education: 1-Standard.1-4, 2- Standard 5-8, 3- Attended secondary. 4- MSCE, 5-Technical College, 7-University. Uses total sample of individuals from 2009, both school participants and non-participants. Dependent variable: 1=delayed school progression, School-for-age value<100; 0=normal school progression, School-for-age value ≥100. Excluded variables *Eldest Child (dummy=1), Child of head (dummy=1), Young adult males (age 20-24), Young adult females (age 20-24), Adolescents aged 15-19, Children aged 6-14, Children under age 6, Distance secondary school(km)* and five district dummies – none were statistically significant at 10% or lower.

However, when splitting the sample by gender, as also seen from Table 5, the positive effect is no longer so clear. In fact, the variable *Education level of female head/wife* is only statistically significant, with a negative coefficient, when using girls' sample (at 5%), while same applies *Education level of male head* when using boys' sample only (1%). Both results indicate support

to hypotheses ***2a-b***, where I stated that mother's education is more positively related to girls' school progression; whereas father's education is more positively related to boys' school progression. In other words, I find support for the hypotheses on gender-based preferential treatment on behalf of both parents. This would suggest that a better educated female head/wife gives more weight to keeping girls in school, entering at the right age and progressing at the normal rate, while same relationship applies between male heads and boys. Notably both parental education variables indicate negative coefficients when using the sample of opposite sex, which would suggest support for ***1a-b***, where I stated that parents' education levels are positively related with children's school progression, however these are not statistically significant at 10%.

Hypotheses ***3a-b*** stated opposite effects of residing in a female-headed household on children's school progression. As seen from Table 5 the variable *Female-headed household* is only statistically significant, albeit at 10% significance level, when using girls' sample only. Moreover, it has a positive coefficient, suggesting that girls residing in a female-headed household are more likely to be delayed in their school progression – making them *overaged*. This result suggest a rejection of hypothesis ***3a***, where I stated that children residing in a female-headed household are positively affected, and supports hypothesis ***3b***, claiming that children in female-headed households are less likely to be progressing through school at a normal rate due to poverty. This referring to the case of girls. An interesting observation is made regarding the same variable when using boys' sample where it indicates a negative coefficient, suggesting that the opposite relationship holds in the case of boys. However, the considerably large standard errors indicates large variations which could be accountable to the low number of observations.

On a conclusive note I acknowledge the drawbacks of using the *overage* variable. As it is binary in nature it only differs between those who have normal school progression as opposed to those who don't, and consequently fails to capture the extent of delayed school progression. That is, it treats both delayed individuals and those who never attended as the same category. A more serious issue relates to unobserved heterogeneity. Throughout the analysis on delayed school progression I have not been able to control for unobserved heterogeneity using panel data

methods as. In other words, the strong effect of both parents' education on school progression may be correlated with family genes and ability to accumulate other forms of capital.

6.3 Dropping out of primary school

The drop-out decision differs from the school progression analysis in that it captures actual level of educational attainment or schooling towards it. Moreover, I employ data from all three years. To refresh, the dropped-out variable differs between individuals who have dropped out of primary school and those who have completed or are still reported to be in school. Table 6 reports the results from household random- and fixed-effects Logit estimation setting lower age limit at eleven and including *Quality of house*. An immediate finding is that girls have a higher probability of dropping out of primary school, as seen from the positive coefficient sign on the statistically significant *Female child* in the random-effects model, which is not unexpected within the Malawian setting. Moreover, children of the household head are clearly favoured, the negative coefficients on the statistically significant *Child of head* indicates they have a lower probability of dropping out, which falls in line with previous studies (Nankhuni & Findeis 2003).

Hypotheses ***1a*** and ***1b*** stated that mother's and father's education are positively related to both boys' and girls' schooling, in this case the educational level attained or in progression to attaining. Reviewing the hypotheses I find support for hypothesis ***1a***, *Education level of female head/wife* positively affect children's presence in school, in this case it is found to reduce the probability of dropping out of primary school before completion for children aged 11-19 years old. This finding is relatively robust as it holds for both household random-effects and fixed-effects models. In terms of the effect of father's education, hypothesis ***1b***, the results are less conclusive. Only when controlling for household fixed-effects is the variable *Education level of male head* statistically significant (at 5%), and moreover it has a positive coefficient indicating that children residing in households with better educated male heads actually have a higher probability of dropping out of primary school. Based on the fixed-effects model I should therefore *reject* hypothesis ***1b***, whereas no evidence is found when using the random-effects model.

Table 6: Logit models: Dropping out (=1) of primary: Individuals aged 11-19: All years		
Variables	**Household random effects**	**Household fixed effects**
Female child (dummy=1)	**0.478****	0.319
	(0.198)	(0.244)
Child's age	**0.414*****	**0.449*****
	(0.050)	(0.061)
Child of head (dummy=1)	**-0.848*****	**-1.220****
	(0.320)	(0.512)
Female headed household (dummy=1)	-0.071	0.172
	(0.346)	(0.906)
Age of household head	0.009	**-0.245****
	(0.063)	(0.123)
Age of household head squared	-0.000	**0.003****
	(0.001)	(0.001)
Education level male head^	0.047	**0.918****
	(0.142)	(0.406)
Education level female head/wife^	**-0.808*****	**-1.155***
	(0.227)	(0.603)
Adult male labour (age 25-64)	0.018	**0.692***
	(0.250)	(0.401)
Young adult females (age 20-24)	**0.483****	**0.649****
	(0.219)	(0.288)
Adolescents aged 15-19	**-0.363****	**-0.748*****
	(0.165)	(0.213)
Children aged 6-14	-0.071	**0.350***
	(0.097)	(0.212)
Children under age 6	0.151	**0.523****
	(0.128)	(0.257)
Quality of house	**-0.091****	0.105
	(0.045)	(0.073)
Year 2007	**0.521****	**0.727*****
	(0.215)	(0.269)
Year 2009	**-0.601****	-0.311
	(0.242)	(0.307)
Constant	-5.734***	
	(1.549)	
lnsig2u Constant	0.533**	
	(0.251)	
Wald $\chi 2$	136.674	
Wald degrees of freedom	25	
LR χ^2		129.554
LR degrees of freedom		19
Log likelihood	-512.136	-177.309
Prob. χ^2	0.000	0.000
Number of observations	1372	631

*Significant at 10% **Significant at 5% ***Significant at 1%. Standard errors reported in parentheses.
^Code for level of education: 1- Standard.1-4, 2- Standard 5-8, 3- Attended secondary. 4- MSCE, 5-Technical College, 7-University. Uses total sample of individuals within specified age category, except for individuals who have never attended school. Dependent variable: 1=positive number of school years, does not attend school and has not completed senior primary school, 0=positive number of school years, attends school or has completed

senior primary school. Not reported but included variables: *Eldest child, Adult female labour (age 25-64), Young adult males (age 20-64), Distance primary school (km)* and five district dummies– none were statistically significant at 10% or lower.

Keeping in mind that the fixed-effects drops half the observations, including all households where the individuals in the stated category always go or never go to school, I cannot make any strong conclusions regarding the effect of father's education. On the other hand, the results seem to suggest that better educated females care more about continued education than their male counterparts. Assuming that more education implies more relative bargaining power females are able to impose their preferences on the school participation when better educated.

I further claimed that residing in a female-headed household would positively affect children's educational attainment, ***3a***, and the contrasting hypothesis ***3b*** where I acknowledged possible poverty effects related to female-headed households. According to Table 6 I am unable to assert anything. Similarly, when splitting the sample by gender, as reported in Table 7, the variable *Female-headed household* is not statistically significant at 10% or lower significance level. Possibly the two stated hypotheses are pulling in opposite directions, rendering the variable not statistically significant.

Table 7 indicates variable evidence regarding the hypotheses ***2a-b*** on gender-based preferential treatment on behalf of the parents. Firstly, regardless of estimation model *Education level of female head/wife* reduces the probability for dropping out of primary school for both girls and boys, indicating rejection of hypothesis **2a**. Only exception is in the household fixed-effects model for girls which could be related to the large standard errors. Viewing parents' education in terms of bargaining power therefore suggests that a stronger positioned woman increases the probability of completing primary or still be enrolled in school with completion as a possible outcome.

Table 7: Logit models: Dropping out (=1) of primary: Individuals aged 11-19: All years: By gender

Variables	Household random effects		Household fixed effects	
	Girls	**Boys**	**Girls**	**Boys**
Child's age	**0.505*** **	**0.349*** **	**0.703*** **	**0.533*** **
	(0.078)	(0.074)	(0.162)	(0.130)
Eldest child (dummy=1)	-0.178	-0.126	**-1.297***	-0.347
	(0.418)	(0.378)	(0.786)	(0.538)
Child of head (dummy=1	**-1.045** **	-0.482	-0.997	**-2.869** **
	(0.468)	(0.457)	(1.367)	(1.130)
Female-headed household (dummy=1)	-0.591	0.430	4.794	-2.418
	(0.517)	(0.472)	(7.517)	(1.744)
Age of household head	0.016	-0.005	**-0.621***	-0.092
	(0.088)	(0.092)	(0.342)	(0.182)
Age of household head squared	-0.000	-0.000	**0.007** **	0.001
	(0.001)	(0.001)	(0.003)	(0.002)
Education level male head^	-0.018	0.145	**2.291*** **	0.034
	(0.181)	(0.203)	(0.889)	(0.723)
Education level female head/wife^	**-0.931*** **	**-0.738** **	-3.270	**-1.405***
	(0.321)	(0.292)	(2.662)	(0.790)
Adult male labour (age 25-64)	0.081	0.098	**1.352***	-0.715
	(0.373)	(0.349)	(0.730)	(0.907)
Young adult females (age 20-24)	**1.211*** **	0.041	**2.162*** **	-0.156
	(0.335)	(0.323)	(0.668)	(0.548)
Adolescents aged 15-19	-0.238	**-0.427***	**-0.663***	**-1.179*** **
	(0.230)	(0.248)	(0.364)	(0.408)
Quality of house	-0.031	**-0.174*** **	**0.373** **	-0.032
	(0.066)	(0.061)	(0.153)	(0.110)
Year 2007	**0.602***	**0.635** **	**1.276** **	0.709
	(0.322)	(0.320)	(0.567)	(0.449)
Year 2009	**-1.049*** **	-0.145	-0.104	-0.032
	(0.383)	(0.341)	(0.662)	(0.560)
Constant	-7.039***	-4.520**		
	(2.172)	(2.222)		
lnsig2u Constant	0.383	0.654**		
	(0.350)	(0.311)		
Wald χ^2	85.725	54.189		
Wald degrees of freedom	24	24		
LR χ^2			72.871	53.400
LR degrees of freedom			18	18
Log likelihood	-235.217	-264.612	-44.338	-62.041
Prob.> χ^2	0.000	0.000	0.000	0.000
Number of observations	620	752	211	237

*Significant at 10% **Significant at 5% ***Significant at 1%. Standard errors reported in parentheses.
^Code for level of education: 1- Standard.1-4, 2- Standard 5-8, 3- Attended secondary. 4- MSCE, 5-Technical College, 7-University. Dependent variable: 1=positive number of school years, does not attend school and has not completed primary school, 0=positive number of school years, attends school or has completed primary school. Not reported but included variables: *Adult male labour (age 25-64 yrs), Young adult males (age 20-24), Adolescents*

aged 15-19, Children aged 6-14, Children under age 6, Distance primary school (km) and five district dummies – none were statistically significant at 10% or lower.

Secondly, I find supporting evidence for hypothesis ***2b***, whereby education of male heads is found to increase the probability of dropping out for girls, statistically significant at 1%, when controlling for household fixed-effects. The fixed-effects model has the advantage of controlling for unobservable heterogeneity that may be correlated with other explanatory variables. In light of this the results indicate that despite higher levels of education of the father, which would be expected to result in better acknowledgement of the advantages of educating, girls have a positive probability of being withdrawn from primary school. This could be related to perceived returns to continued education, whereby girls' future prospects are not viewed as being positively related with education. Whether better educated males have a positive impact on boys' continuation in primary school is uncertain, which makes it unclear whether father's education is more positively related to boy's educational attainment as stated in ***2b***. In any respect, the robustness of these results are questionable, due to the restricted number of observations that the fixed-effects estimation uses.

Although not explicitly testing for this here, controlling for household-fixed effects when using girls' sample gives results indicating contrasting evidence to the "too poor to school" hypothesis, ***4a***. This would suggest that households are not credit-constrained, when viewing girls' schooling as an investment decision, and contrast most studies where poverty has been found to be one of the main factors causing drop-outs (Brown & Park 2002). The results suggest instead that less poor households, in terms of housing quality, are more likely to withdraw girls from schools, contrasting the opposite relationship observed by Kadzamira and Rose (2003). This could pertain to the fear of pregnancy and the desire for marrying daughters off well, although the already discussed problems related to the household fixed-effects model may indicate that the problem lies in attrition bias.

The nature of the dependent variable requires some final comments. Firstly, the age sample used does not allow for ascertain whether certain individuals may return to school at a later stage. Secondly, for the older individuals I may not be capturing the actual factors that related to the probability of dropping out, since circumstances may have changed from when they actually

dropped out. On the other hand, the focus being primarily on parents' education this may not be so serious. Thirdly, the samples used may suffer under sample selection bias. Throughout the estimation of Model 3 I have excluded individuals who never entered school in the first place. Consequently, the estimates may be biased, not adequately reflecting the educational attainment of this age category. Moreover, this could explain an opposite poverty effect for girls is observed as girls who never entered primary school may in fact have been prevented due to resource constraints.

As several models have been used to test the same hypotheses I provide an overview in Table 8 of the results pertaining to internal household characteristics. Using Model 1 and Model 3, probability of attending school and dropping out of primary, gave results supporting the notion that mothers' education is positively related to children's schooling. Better educated mothers contributed to increased probability of school participation on an annual basis and reduced probability of dropping out. In terms of school progression, on the other hand, mothers' education only reduces the probability of girls being *overaged*, whereas no statistically significant effect is observable for boys. Regarding fathers' education the results are even less certain. Fathers' education is found to be positively related to girls' school participation only; while negatively related to delayed school progression for boys only. There is in other words no clear overall positive relationship for neither gender. However, the probability of girls dropping out of primary school increases with fathers' level of education while for boys the results are uncertain.

The results are also somewhat inconclusive regarding residing in a female-headed household although the general picture seems to indicate a negative effect. In Model 1 the variable is statistically significant, reducing the probability of attending for both genders; whereas in Model 2 I also found that girls residing in female-headed households were more likely to be delayed in their school progression. Children residing in better-off households, as identified by housing quality, had on the other hand a higher probability of attending school, although the support was weak for girls. Moreover, in terms of labour constraints and gender-based substitutes in labour the results are largely inconclusive and indicate at the most a rejection of the related hypotheses, except for in the case of female adult labour.

Table 8: Issues, hypotheses tested and samples used for Models 1-3

		Model 1			Model 2			Model 3		
Dependent variable		**Annual school participation**			**Delayed school progression: ovearge**			**Dropped out of primary**		
Sample used		Age 6-19, All years			Age 7-19, Year 2009			Age 11-19, All years		
		All	*Girls*	*Boys*	*All*	*Girls*	*Boys*	*All*	*Girls*	*Boys*
Parents' education and gender	***H1a***	**S**	**S**	**s**	**S**	**S**	**?**	**S**	**s**	**S**
	H1b	**?**	**S**	**?**	**S**	**?**	**S**	**R**	**r**	**?**
	H2a		**r**	**?**		**S**	**S**		**?**	**?**
	H2b		**?**	**r**		**S**	**S**		**?**	**?**
Female-headed household	***H3a***	**r**	**R**	**r**	**?**	**r**	**?**	**?**	**?**	**?**
	H3b	***s***	***s***	***s***	**?**	**s**	**?**	**?**	**?**	**?**
Poverty and gender	***H4a***	**S**	**S**	**S**						
	H4b	**?**	**?**	**?**						
	H4c		**?/r**							
	H4d			**?/r**						

Codes: S-support, s-weak support, ? – uncertain, r-weak rejection, R-reject

6.4 External factors: dominant inheritance system and residential location

In analysing how inheritance system and residential location may affect children's schooling I use the binary delayed school progression measure *overage*, based on the School-for-age (SAGE) formula. I proceed by analysing the results with caution since the dominant inheritance systems is identified on a regional basis, and there may therefore be substantial endogeneity problems involved. Moreover, due to multicollinearity the district dummies are here excluded. In order to focus on the dominant residential types I have excluded households that reside neo-locally from the analysis. Table 9 reports the Logit model results capturing all individual, aged 7-19 years old, and then splitting the sample by gender. The high standard errors for all coefficients related to residential and regional location suggest that the results should be interpreted with carefulness.

Table 9: Logit models: Delayed (=1) or normal (=0) school progression: Individuals aged 7-19: Year 2009: External factors

Variables	ALL	GIRLS	BOYS
Female child (dummy=1)	-0.082		
	(0.233)		
Age	**1.778*** **	**1.685*** **	**2.125*** **
	(0.279)	(0.375)	(0.476)
Age squared	**-0.053*** **	**-0.048*** **	**-0.066*** **
	(0.011)	(0.014)	(0.019)
Female-headed household (dummy=1)	-0.392	0.346	-0.718
	(0.455)	(0.788)	(0.576)
Education level male head^	**-0.266** **	-0.041	**-0.600*** **
	(0.133)	(0.217)	(0.198)
Education level female head/wife^	**-0.568*** **	**-0.853*** **	-0.273
	(0.165)	(0.307)	(0.210)
Adult female labour (age 25-64)	**0.676***	0.519	**0.880***
	(0.353)	(0.407)	(0.474)
Young adult females (age 20-24)	-0.401	-0.187	**-0.720***
	(0.310)	(0.436)	(0.425)
Children aged 6-14	0.185	-0.021	**0.345***
	(0.126)	(0.211)	(0.205)
Quality of house	**-0.167*** **	-0.119	**-0.217*** **
	(0.054)	(0.078)	(0.076)
Matrilocal * Southern Region (dummy=1)	0.491	-0.091	**1.031***
	(0.370)	(0.528)	(0.536)
Matrilocal * Central Region (dummt=1)	0.121	-0.009	0.149
	(0.422)	(0.589)	(0.612)
Patrilocal * Southern Region (dummy=1)	-0.346	**-1.177***	0.736
	(0.455)	(0.676)	(0.621)
Constant	-8.599***	-8.005***	-10.795***
	(1.978)	(2.960)	(2.996)
Log Likelihood	-229.237	-112.547	-105.426
Wald χ^2	170.198	143.113	70.015
Wald degrees of freedom	23	22	22
Pseudo R^2	0.3646	0.3705	0.4139
Prob.> χ^2	0.000	0.000	0.000
Number of observations	688	316	372

*Significant at 10% **Significant at 5% ***Significant at 1%.
Standard errors corrected for clustering at household level reported in parentheses. ^Code for level of education: 1- Standard 1-4, 2- Standard 5-8, 3- Attended secondary, 4- MSCE, 5-Technical College, 7-University.
Uses total sample of individuals from 2009, both school participants and non-participants, excluding individuals residing neolocally. Excluded variables *Eldest Child (dummy=1), Child of head (dummy=1), Young adult males (age 20-24), Young adult females (age 20-24), Adolescents aged 15-19, Children aged 6-14, Children under age 6, Distance primary school(km)* and *Distance secondary school(km)* – none were statistically significant at 10% or lower. Patrilocal*Central Region is the reference dummy for the interaction dummies.

Table 9 reports first for when using total sample of children, and indicates that none of the interaction dummies are statistically significant negative at 10% or lower. I postulated in hypotheses ***5a-b*** that children's schooling is positively related to the dominant inheritance system, given same gender focus, and that this will affect school progression. Splitting the sample by gender gives some interesting results. When using the sample of girls the interaction dummy *Patrilocal*Southern Region* is statistically significant with a negative coefficient. This indicates that girls are less likely to be delayed in their school progression when residing patrilocally within a predominantly matrilineal society than when residing patrilocally within a predominantly patrilineal society. Matrilocal residence, regardless of dominant inheritance system, does not seem to differ from patrilocal in a patrilineal area. In other words, I cannot assert anything regarding hypothesis ***5a***, where I stated that matrilocal residence in a predominantly matrilineal society positively affects girls' schooling more than when residing patrilocally in a patrilineal society. However, the lack of significance may be accountable to the few observations, as indicated by the large standard errors, and the coefficient signs on the interaction dummies *Matrilocal*Southern Region* and *Matrilocal*Central Region* are both negative suggesting a similar relationship. Moreover, I find no supporting evidence for hypothesis ***6a***, patrilocal residence within a dominantly matrilineal society does not seem negatively affect girls' schooling. However, the large standard errors restricts the conclusive power, and therefore neither rejection nor clear support is identifiable here.

Using boys' sample gives different results. Matrilocal residence in a predominantly matrilineal society results in a higher probability of having delayed school progression among boys, as compared to patrilocal residence in a patrilineal society. The interaction dummy *Matrilocal*Southern Region* is statistically significant with a positive coefficient, albeit only at 10% significance level, suggesting a higher probability of being overaged. In other words, boys' schooling is negatively affected when residing matrilocally in a matrilineal society. Since patrilocal residence in a patrilineal society is the dummy reference this implies that the results lend support to hypothesis ***5b***, where I claimed that boys' schooling is more positively affected when residing patrilocally in patrilineal societies than when residing matrilocally in matrilineal societies. However, I do not find evidence for boys' schooling to be negatively affected by residing matrilocally within a predominantly patrilineal society, as stated in hypothesis ***6b***,

although the positive coefficient sign suggest that this might have been the case had the sample been larger.

Using regional dummies in order to control for dominant inheritance system presents potential endoeneity problems. Difference in inheritance systems may in fact be accountable to regional differences. The Southern region has on average a higher population density and poverty rates (Government of Malawi & World Bank 2006), which could constrain school participation and progression. I therefore run separate regressions, dropping the interaction term and instead adding a dummy capturing regional fixed effects. According to the results, reported in appendix A3, the regional dummy *Southern Region* is statistically significant when using boys' sample and sample of all children, while not when using girls' sample. This may suggest that regional differences explain the higher probability of delayed school progression for boys, but does not account for why a similar effect is not observable for girls. Similarly, previous studies have argued that the matrilineal inheritance system is detrimental to children school, but according to these results, this only holds for boys.

Another dimension of uncertainty pertains to unobserved household heterogeneity. The restricted use of data from 2009 and the time-invariant nature of the main explanatory variables of interest prevents controlling for unobservable household random- and fixed-effects further compounds the restricted interpretation of the results. Furthermore, I have not investigated possible selection bias in defining dominant inheritance system based on regional area, due to lack of access to suitable instruments, nor controlled for possible endogeneity related to choice of residential location. However, as I have in part used residential location to reflect internal bargaining power the latter issue may not be so serious, since choice of residential location may in fact reflect internal bargaining power. Nevertheless, I acknowledge the restricted conclusive power in terms of residential location and inheritance system.

Keeping this in mind, I report the results in Table 10 for hypotheses ***5a-6b***. The results suggest that girls' school progression, as measured by the binary *overage* is positively affected by residing patrilocally in the Southern Region as compared to the Central Region only. What is interesting is that a similar effect is not found when residing matrilocally within the same

matrilineal area. Given that I can assert that the party bringing land into the marriage has a stronger foothold, and is more able to influence the decision outcome this would suggest that father's use this positively affect girls' schooling; whereas a similar behaviour is not observable on behalf of the mother – as defined by matrilocal residence. Previous findings from a matrilineal society in Tanzania (Machimu & Minde 2010) observe a similar relationship where the father is found to invest more in children, and especially girls, than what mothers do. I do not find a positive influence of residing patrilocally within a matrilineal society for boys, but which was not expected either as the reference dummy is an area where boys' may be more strongly positioned given the patrilineal inheritance principles.

Table 10: Issues, hypotheses tested and sample used for Model 4

		Model 4	
Dependent variable:		Delayed school progression: overage	
Sample used:		Age 7-19, Year 2009	
		Girls	*Boys*
Inheritance systems and residential location	***H5a***	**?**	
	H5b		**S**
	H6a	**?**	
	H6b		**?**

Boys' school progression is negatively affected by residing matrilocally within a matrilineal area. Given that I can assert that the party bringing land into the marriage has a stronger foothold, then this would indicate that more bargaining power to the wife in the household does not positively affect boys' schooling. Moreover, in terms of matrilocal residence in the Southern Region this also suggest a lack of egalitarian bequest motives on behalf of the mothers since the sons are not expected to receive land either according to the dominant inheritance principles. One could argue that better educated women give greater weight to education and bargain for more schooling for all children; whereas females with mainly land as the basis for their stronger bargaining position do not necessarily assign greater value to education. However, these contrasting results may also indicate that I have not adequately capture the effect of residing matrilocally nor matrilineally, as already discussed.

Throughout this thesis I have made certain assumptions that may limit the generalisation of the results. Firstly, parents are assumed to be altruistic and perceived non-negative returns in investing in education. Secondly, all children regardless of gender are assumed to be allowed to attend school. Within other societies where the focus may be more gender-biased these discussions may not be as suitable.

7. CONCLUSIONS

The decision on whether to send children to school or not is essentially one made by the household. In this thesis I have strived to identify factors affecting children's human capital accumulation, in terms of educational attainment, with special focus on the child's gender and how parents may give preferential treatment to children of same sex as themselves. Analysing the school participation within a conceptual framework allowed for acknowledging preferences and how parental characteristics, identified by own levels of education, enables them to impose their preferences on the school participation decision. Moreover, I have recognised the possible presence of resource constraints in affecting the decision outcome and in preventing parents to follow-up on preferences for sending children to school.

As children's schooling is a long-term investment I have sought out multiple entry points for how parents may influence the school participation decision. Mothers' education has throughout a strong effect on annual school occupation, school progression and probability of continuing in primary school, indicating that better educated mothers bargain for more investment in their children's education. This holds regardless of gender, except for in the case of school progression where I find that only girls' school progression is positively affected indicating that special preference is given to children of their own sex in terms of progressing through school at a normal rate.

Better educated fathers, on the other hand, show mixed tendencies for how they choose to influence the school participation decision outcome. On an annual basis there is weak support for fathers encouraging children's schooling, and the little evidence found indicates that this is directed at girls. When widening the focus I find that also better educated fathers use their influence to get boys through school at the expected rate, showing tendencies for favouring children of their own sex in a similar manner as the mothers. On the other hand, in terms of encouraging the finalisation of an educational level, in this case primary school, the impact of the father is uncertain.

Poverty is found to constrain children's school participation, this regardless of gender, which implies that policies focusing at poverty alleviation serve a twofold benefit. Firstly, it would

expand households' decision room and strengthen their ability to focus on long-term investments rather than having to heed immediate needs. Secondly, increased human capital accumulation within the household would generate positive externalities benefiting society and also the next generation as better educated parents positively influence children's school entry age and school progression, albeit with a substantial gender-bias that demands attention.

However, the type of resource constraints that impedes school participation demands a thorough analysis before attempting at making policies directed at improving school attendance. In terms of labour constraints this analysis revealed interesting internal dynamics between children and young adults. Evidently presence of young adults may have a negative effect on the school participation of children of same gender. This may pertain to delayed enrolment and progression among the young adults themselves, whereby a vicious circle of delayed and sporadic attendance is created within the household. Policies directed at reducing late enrolment would benefit both these individuals and individuals to come within the households. On the other hand, improving the off-farm labour market may not be solely be of a positive character, as the internal labour demand may supplant itself from young adults to younger household members.

I find in general little evidence of female-headed households improving children's schooling. Throughout the analysis the effect of the sex of household head is difficult to deduce, and seems at most to suggest a reduced investment in children's human capital, and of girls particularly. That women's understanding and valuation of children's education is primarily related to own education rather than more altruistic preferences cannot be excluded. However, the female-headed households being on average poorer than their male counterparts suggests that mother's preferences and the need to satisfy internal household demands may be two forces pulling in opposite directions, thereby preventing identification of the effect on schooling. Nonetheless, this may indicate that one should be careful in drawing too strong conclusions regarding women's positive effect.

Similar contemplations are in need when examining the effect of dominant inheritance system and residential location on children's school participation. The results indicate that boys' school progression is negatively affected by residing matrilocally within a predominantly matrilineal

society, as opposed to patrilocal residence within a patrilineal society. This could indicate heterogeneous behaviour based on behalf of the mother, whereby the basis for decision power, in this case land, results in different preferences and perceived returns in terms of investing in boys' education. Although boys have a less clear livelihood option, as they cannot expect to inherit land within the matrilineal society, they are not compensated with increased schooling. Interestingly girls are only positively affected when residing patrilocally within a matrilineal society, relative to a patrilineal society, which may indicate that fathers view children's education as a more necessary investment when they themselves face a more insecure future. However, the matrilineal society is found in the Southern Region, where poverty intensity is higher, and the problem of potential endogeneity pertaining to this has not been adequately coped with. I will not claim that it is the combination of residential location and inheritance system itself that is accountable for the observed gender difference. Rather I propose continued investigation into the gender dimension and children's school outcome.

Nonetheless, the results also suggest the presence of other factors affecting the decision outcome than what I have here been able to pinpoint. I have in part controlled for unobserved heterogeneity, using panel data methods, and although the results are unclear the difference in fixed effects and random effects indicates presence of other factors at both household and individual level that should be identified in order to succeed in improving children's educational attainment.

Summing up, the overall picture suggests that policies directed at poverty alleviation is the most important entry point as reduced poverty will also lead to improved levels of educational attainment, thereby initiating a positive circle of development. However, a better understanding is clearly needed as to who takes the decision regarding children's schooling, and especially that of girls'. Encouraging girls' participation and educational fulfilment should be given special emphasis as better educated women in general generate positive externalities for the following generation of children.

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Appendix I

A 1: Characteristics of households with one or more individuals aged 4-19 years old

Variables	Observations	Mean	Std. Dev.	Min	Max
Female headed household (dummy=1)	1046	.24	.43	0	1
Age of household head	1046	44.89	14.44	18	85
Age of household head squared	1046	2223.50	1417.60	324	7225
Education level of male head^[5]	1046	.97	.96	0	5
Education level of wife/female head^	1046	.53	.78	0	4
Household size	1046	5.59	1.94	2	12
Children under age 4*	1046	.59	.67	0	4
Children under age 6*	1046	.99	.93	0	5
Children aged 4-14*	1046	2.15	1.26	0	8
Children aged 6-14*	1046	2.42	1.48	0	8
Adolescents aged 15-19*	1046	.66	.81	0	5
Young adult males (age 20-24)*	1046	.21	1.48	0	3
Young adult females (age 20-24)*	1046	.20	.47	0	3
Adult male (age 25-64)*	1046	.75	.54	0	4
Adult females (age 25-64)*	1046	.89	.47	0	4
Adult equivalent consumers	1046	4.36	1.58	1.3	10.1
Consumer worker ratio	1046	1.31	.259	.8	2.8
Housing quality index	1046	8.73	2.69	4	14
Distance to primary school (km)	1046	3.04	2.90	.5	10
Distance to secondary school (km)	1046	5.45	5.41	1	20
Matrilocal residence	1046	.62	.49	0	1
Patrilocal residence	1046	.33	.47	0	1
Neo-local residence	1046	.05	.23	0	1
Southern Region (dummy=1)	1046	.59	.50	0	1

^Code for level of education: 1- Standard 1-4, 2- Standard 5-8, 3- Attended secondary, 4- MSCE, 5-Technical College, 7-University. *Indicates that the variable reports the number of individuals in the household within the specified age category.

[5] In households where either the male head or female head is missing the mean level of education for the respective gender is used to indicate level of education.

A 2: Model 1: Logit models: To school or not to school: Individuals aged 4-19: All years

Variables	Household random effects	Household fixed effects	Individual fixed effects
Child's age	**1.745*** **	**1.750*** **	**1.474*** **
	(0.085)	(0.091)	(0.208)
Child's age squared	**-0.073*** **	**-0.073*** **	**-0.069*** **
	(0.004)	(0.004)	(0.009)
Eldest child (dummy=1)	**0.288***	0.289	0.318
	(0.158)	(0.176)	(0.420)
Child of head (dummy =1)	**0.497*** **	**0.557** **	0.810
	(0.187)	(0.248)	(0.973)
Female-headed household (dummy=1 if female)	-0.244	**-1.038** **	-0.349
	(0.241)	(0.449)	(0.715)
Age of household head	0.040	**0.160** **	0.086
	(0.038)	(0.063)	(0.103)
Age of household head squared	-0.000	**-0.002*** **	-0.001
	(0.000)	(0.001)	(0.001)
Education level male head^	0.141	-0.039	0.035
	(0.088)	(0.185)	(0.239)
Education level female head/wife^	0.144	0.118	**0.671***
	(0.116)	(0.234)	(0.387)
Adult male labour (age 25-64)	-0.157	**-0.548***	-0.572
	(0.184)	(0.282)	(0.376)
Adult female labour (age 25-64)	0.061	0.099	0.500
	(0.169)	(0.222)	(0.324)
Young adult males (age 20-24)	**-0.268***	-0.320	-0.292
	(0.148)	(0.204)	(0.291)
Young adult females (age 20-24)	**-0.398*** **	**-0.629*** **	-0.293
	(0.153)	(0.195)	(0.233)
Adolescents aged 15-19	**0.272** **	**0.490*** **	**0.574*** **
	(0.106)	(0.131)	(0.192)
Children aged 6-14	-0.074	**-0.271*** **	-0.214
	(0.064)	(0.099)	(0.160)
Children under age 6	**-0.137***	**-0.299*** **	**-0.395** **
	(0.078)	(0.112)	(0.168)
Quality of house	**0.111*** **	0.020	0.088
	(0.028)	(0.040)	(0.054)
Year 2007 (dummy =1)	**-0.553*** **	**-0.603*** **	-0.249
	(0.128)	(0.139)	(0.183)
Year 2009 (dummy=1)	**0.481*** **	**0.453*** **	**1.253*** **
	(0.139)	(0.158)	(0.274)
Lilongwe District (dummy=1)	**-1.193** **		
	(0.557)		
Constant	-9.510***		
	(0.990)		
lnsig2u Constant	0.302*		
	(0.173)		
Wald χ^2	505.075		
LR χ^2		713.480	236.921
Prob .> χ^2	0.000	0.000	0.000
Log likelihood	-1323.397	-658.778	-197.897

Number of Observations	2945	2379	879

*Significant at 10% **Significant at 5% ***Significant at 1%. Standard errors reported in parentheses. ^Code for level of education: 1- Standard 1-4, 2- Standard 5-8, 3- Attended secondary, 4- MSCE, 5-Technical College, 7-University. Dependent variable: 1=individual has school as main occupation, 0=individual does not have school as main occupation. Not reported but included variables: *Female child (dummy=1), Distance primary school (km)* and *Distance secondary school (km)* – none were statistically significant at 10% or lower. From household random-effects four district dummies are also included but not reported.

A 3: Model 4: Logit models: Delayed (=1) or normal (=0) school progression: Individuals aged 7-19: Year 2009: By gender: With Southern Region dummy

Variables	GIRLS	BOYS
Age	1.664***	2.131***
	(0.382)	(0.475)
Age squared	-0.047***	-0.067***
	(0.015)	(0.019)
Female-headed household (dummy=1)	0.695	-0.657
	(0.858)	(0.557)
Education level male head	-0.008	-0.596***
	(0.212)	(0.191)
Education level female head/wife	-0.767***	-0.270
	(0.270)	(0.209)
Adult female labour (age 25-64)	0.488	0.911*
	(0.386)	(0.471)
Young adult females (age 20-24)	-0.208	-0.704*
	(0.405)	(0.416)
Children aged 6-14	-0.067	0.341*
	(0.195)	(0.201)
Quality of house	-0.133*	-0.224***
	(0.077)	(0.073)
Southern Region (dummy=1)	-0.375	0.921*
	(0.454)	(0.474)
Constant	-7.621**	-10.819***
	(2.966)	(3.017)
Log Likelihood	-114.404	-105.563
Wald χ^2	146.851	69.901
Wald degrees of freedom	20	20
Pseudo R^2	0.3601	0.4132
Prob.> χ^2	0.000	0.000
Number of observations	316	372

*Significant at 10% **Significant at 5% ***Significant at 1%. Standard errors corrected for clustering at household level reported in parentheses. Uses total sample of individuals from 2009, both school participants and non-participants, except for households residing neo-locally. Excluded variables *Eldest Child (dummy=1), Child of head (dummy=1), Adult male labour (age 25-64), Young adult males (age 20-24), Adolescents aged 15-19, Children under age 6*, *Distance primary school (km)* and *Distance secondary school(km)* – none were statistically significant at 10% or lower.

Appendix II: Focus group discussion questionnaire 2009

NOMA Focus group questionnaire 2009

1. Infrastructure: How is the access to services? Distance from village to these?
   - electricity
   - water
   - credit (informal and formal)
   - education/schooling
   - health services
   - market access for: consumption goods, agricultural products and forest products
   - road

2. Enterprise:
   - What are the most important income generating activities in the community?
   - What are the five most important enterprises for people in this community?
   - What are the reasons for this?

3. Labour allocation
   - What was the typical daily wage rate for unskilled agricultural/casual adult male/female labour during the peak/slack season in this village over the past 12 months?
   - What is the typical daily wage rate for a common forest employee?

4. Markets
   - In the previous three consecutive seasons have you ever achieved surplus of maize, but lacked access to market?
   - What was the highest price for maize during the past 12 months?
     tobacco
     groundnuts
     head load of firewood
     100kg bag of charcoal
   - What is the sales value of one hectare of good agricultural land in the village?

5. Shocks
   - What have been the major shocks in this village within the last two years?
   - What strategies have been used in the community to cope with these shocks? (NGOs, government, households)
   - How would the community assist a household that has experienced a shock?

6. Credit
   - What are the main types of credit in this area? (informal, formal)
   - What are the modalities for the access to informal credit?

7. Land markets

8. How have the livelihoods within this community changed over the past two years?
9. What is your perception of the subsidy programme? Have you benefitted from it?
10. What major forest types are available in this village? (Natural forest, managed forest, plantation)
11. Why do you undertake activities off your own farm? Attracted by higher payment? – If so, continue with these questions:

- Why don't you engage in it permanently?
- If there are good conditions, are you willing to engage on off farm activities permanently?
- Are you willing to sell your land if you are engaged on off-farm activities permanently?

Appendix III: Household questionnaire 2009