

Background Paper The Learning Generation

Financing Education Equity

A Study of Three Country Cases

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Contents

1	Executive Summary	2
2	Introduction	5
3	Methodology	7
3.1	Data sources	7
3.2	Research Question 1	7
3.3	Research Question 2	8
3.4	Research Question 3	8
3.5	Limitations.....	10
3.5.1	Data Limitations	10
3.5.2	Methodological Limitations	11
4	Case studies:.....	13
4.1	Malawi	13
4.1.1	Context.....	13
4.1.2	Results	15
4.2	Ethiopia.....	28
4.2.1	Context.....	28
4.2.2	Results	30
4.3	Uganda.....	41
4.3.1	Context.....	41
4.3.2	Results	42
5	Conclusions and policy implications	53
6	References.....	55
	Annex.....	58
6.1	Theoretical household spending and school attendance model.....	58
6.2	Empirical Specification	61

1 Executive Summary

What is the relationship between educational equity and school financing? To what extent do public resources compensate or exacerbate disparities in the quality of schooling? This research project examines the relationship between private and public spending in education, using three cases from Sub-Saharan Africa: Malawi, Ethiopia, and Uganda. Across all three countries, primary school fees have long been abolished; however, as education systems face resource constraints, families are routinely asked to contribute towards the schooling of their children. While family participation in school finance is not in itself a negative phenomenon, the implications of the extent of expected financial contribution can be a concern from an equity standpoint – and as such, may require a rethinking and reorientation of policy making and international technical and financial assistance. In this study, we unpack the nature of the household spending on education and investigate whether the expected cost of participation substantially deepens the equity gap between the poor and the relatively wealthier households in school enrollment decisions.

Our analysis of sub-national government spending on education in these three countries shows great variability in per pupil spending across districts and provinces. Looking at household spending on education, disparities between wealth quintiles, the poorest and the wealthiest in particular, are obvious, with the wealthiest families being able to invest much more in education when government spending is inadequate. The extent of these disparities, however, varies across the three countries.

Across all of the case study countries, we estimate the effects of expected out-of-pocket costs of school participation on households' decisions for their children to attend school, and find fairly consistent patterns in the results:

- In Malawi, Ethiopia, and Uganda, we show evidence that the probability that a school-aged child attends school is higher with lower associated costs of schooling.
- The likelihood of attendance among the poorest quintiles, across all case study countries, is more adversely affected by rising costs of schooling.
- The effects of overall education spending on the likelihood of attendance are higher than those of spending on school fees in Ethiopia and Uganda.
- However, we show that the main driver of the effect of schooling costs in Malawi is changes in tuition fees.

The following specific findings emerge from each country case study:

Malawi:

- Education-related costs make up about 1% of total expenditures in households with primary school attending children. Households with children attending secondary school, which is not free, spend about 4.5%.
- The cost of attending public secondary school is about 16 times higher than the cost of attending public primary schools, and private education costs 10 and 3 times more than public education at primary and secondary levels, respectively.

- Families with children attending public primary schools spend most on school uniforms and school supplies, which, notably, are similarly expensive to supplies and uniforms in private schools.
- The costs of attending public secondary are more than the costs of private primary, demonstrating that attending secondary school would likely not be affordable for the majority of the Malawi population if more children were able to pass the Primary School Leaving Examination (PSLE) offered at the end of primary school.
- Although the total amount of public education funding is highly correlated with the number of students at the sub-national level, per pupil spending varies across districts, with some of them receiving twice as much per student as others. No clear patterns between poverty levels and per pupil spending can be identified across districts at either primary or secondary level.
- An average primary school age child in the wealthiest quintile has about 1.5 times more education resources than a child of the same age in the poorest quintile, while at the secondary level, the wealthy child has about 5 times more education resources.
- **Eliminating all out-of-pocket expenses on education from households would increase the likelihood of school attendance by about 26 percent.**
- **Eliminating household expenses on education entirely among the poorest two quintiles would increase the likelihood of school attendance by 43 and 54 percent, respectively.**
- **The effect sizes are similar when examining the effect of tuition fees.**

Ethiopia:

- Households with children enrolled in primary education spend about 1.1% of their total household expenditures on costs related to school attendance. By far, the highest spending on primary education can be observed in Addis Ababa (6.6% of total household expenditures) where the highest percentage of children is enrolled in private schools (52%, versus 6% in the rest of the country).
- The cost of attending public secondary school is about 4 times higher than the cost of attending public primary schools, and private education costs 15 and 11 times more than public education at primary and secondary levels, respectively.
- There is a high variability in per student spending across the regions, with some regions receiving 11 times more resources per student than others, and cities receiving more funding per student than rural areas.
- Dire Dawa, Addis Ababa, and Harari, three cities receiving the highest per student spending for both primary and secondary education, have the lowest portion of the population in the lowest wealth quintile.
- A primary age child in the wealthiest quintile has 1.6 times more education resources than a primary age child in the poorest quintile.
- **If households were not expected to spend any amount of money on schooling, we predict that net secondary attendance rates would increase by 85 percent, from 5.4 percent to 9.9 percent.**

- **The poorest quintile would experience an 87 percent increase in net attendance, while the second poorest would experience a 46 percent increase in net attendance from eliminating all education out-of-pocket expenses.**
- **Eliminating tuition fees alone would only increase net attendance by about 6 percent.**

Uganda:

- The cost of attending public secondary school is about 10 times higher than the cost of attending public primary schools, and private education costs 5 and 1.3 times more than public education at primary and secondary levels, respectively.
- Given the free and compulsory education laws from primary school in Uganda, tuition and fees at government primary schools should be zero. In practice, however, school fees are still the highest portion of overall spending per child attending primary education, even for families with children attending public schools. School supplies and “other costs” constitute the second and the third largest categories of expenditures.
- An analysis of expenditure data by region shows some equity in resource distribution. Government scholarships in the Central region, which is the most urban and the wealthiest with less than 23% of families in the poorest quintile, are well below the national averages (22%). In contrast, the poorest region (Western) has the largest percentage of children on government scholarships (58.47%). However, the poorest are still spending disproportionately more on tuition and fees relative to their income. The poorest quintile has only 1.5% of the wealth of the top quintile but their spending is about 4.5% of what the wealthiest quintile spends.
- Although the four large regions receive relatively similar government financial support, across districts there is greater variance in both government spending and the allocation of government scholarships, pointing to a number of particularly under-resourced areas.
- **Lowering out-of-pocket household expenditures on education approximately doubles current net attendance rate at the secondary level from 5.5 percent to 11.1 percent.**
- **We find that the poorest quintiles are most affected by reducing the cost of attendance. However, we note that the high effect sizes are also a function of extremely low net attendance rates for the poorest quintile in Uganda.**
- **Finally, we predict that completely eliminating tuition fees would increase overall net attendance rates by 33 percent.**

2 Introduction

After the abolition of school fees at the turn of the century, coupled with growth in the population of school-age children, many countries in the Global South have had to face the challenge of financially sustaining service provision in their rapidly expanding education systems. While for some, steady economic growth has helped to generate additional resources (EPDC, 2014; UIS, 2011), the challenges of resource allocation and the provision of adequate quality are ever more important now, as the world has entered a new development landscape, framed by the Sustainable Development Goals agenda. High repetition and dropout rates and the strikingly low outcomes on many learning assessments serve as stark manifestations of the inadequacy and inefficiency in education resource provision in many countries.

In the context of resource scarcity, effective use of public finance in the education sector is of paramount importance. Even more crucial is equitable use of public finance, bringing the most disadvantaged groups and individuals closer to the societal average. Data on government education spending is not as easily accessible as enrollment figures. If available, it is often outdated and presented only at the national level. In order to look at equity in education spending it is essential to look at how education finance is distributed across regions, populations, and school levels. For the purpose of this analysis, we identified three countries: Malawi, Ethiopia, and Uganda, with published information of education spending disaggregated at the sub-national level, to look at the equity issues and gain a better understanding of how domestic resources are distributed.

The three countries were also selected due to availability of a recent household survey with a module dedicated to household spending on education. Analyzing household spending on education alongside government expenditures provides a more complete picture of the extent of disparities between groups and regions in terms of access to education resources. With the abolishment of primary school fees, household contributions to education could be expected to be low at the primary level, but remain significant for post-primary education. Often though, hidden costs such as uniforms and transportation persist even at the primary level. Inevitably, their existence is the biggest burden for the poorest, who have to make trade-offs between educating their children and addressing their most basic needs. Furthermore, data on household spending on private education can serve as a lens into the growing presence of the private education sector in the developing world (UNESCO, 2012). This report looks at the patterns in household spending on both public and private education and describes how it varies at the sub-national level, with a particular focus on families from different wealth quintiles.

Ultimately, we are interested whether the cost of school participation, which could include fees, but also school supplies, transportation and many others, affects families' decision to enroll their children. Using household survey data on grade and level attendance by wealth quintile in our regression analysis gives us an opportunity to determine to what extent costs associated with education are prohibitive to attendance and how this effect differs across households with different levels of wealth.

This report is structured in the following way: We start with a methodology section which describes our three main research questions and methods we used to address them, explains the data sources used, and highlights some limitations related to both the data and the methods chosen for this study. The methodology is followed by three case studies, for Malawi, Ethiopia and Uganda, each starting with an overview of key information related to the country's demographic and education context, followed by results of our analysis organized by the order of the three research questions that we pose.

3 Methodology

This report examines public education resource distribution and private household spending on education at the subnational level by addressing the following three research questions:

- Research Question 1. What are the patterns in public and household spending on education at the subnational level within the case countries?
- Research Question 2. Are education resources available for school-aged children distributed equitably across wealth quintiles and subnational regions?
- Research Question 3. How does the cost of school participation affect attendance decisions among households? Do attendance decisions in relation to potential household spending on education vary by wealth quintile?

The research questions are addressed through an analysis of subnational data for Malawi, Ethiopia, and Uganda, presented in three case studies. This section explains the data sources and methods used in the analysis. Each case study uses similar methods, modified based on the differences in available data and the country context.

3.1 Data sources

The main data sources used in this report are government records and household surveys. Data on national and subnational public spending on education were included in statistical education abstracts produced by the government of the respective countries (Government of Malawi, 2012; Ethiopian Federal Ministry of Education, 2013 & 2014, Uganda Ministry of Education, 2011). In the case of Uganda, briefing papers from the Uganda Ministry of Finance, Planning, and Economic Development were also used.

For household level education data, we use the World Bank's Living Standards Measurement Surveys (LSMS), which include a module dedicated to education asking questions about school attendance of children within the households, as well as about how much is spent on school related costs.

3.2 Research Question 1

What are the patterns in public and household spending on education at the subnational level within the case countries?

We address the first research question through in-depth descriptive analyses of household expenditure data from LSMS datasets, combined with district/province level public

education spending at the subnational level. Given the richness of the LSMS datasets, we are able to provide a comprehensive overview of how much households spend on education across districts, ethnic/religious groups, urban/rural areas, and wealth quintiles. At the district or region level, we contrast government spending on education with indicators of “need”, such as school participation rates, percentage of poor and others.

3.3 Research Question 2

Are education resources available for school-aged children distributed equitably across wealth quintiles and subnational regions?

We address the second research question through an analysis of education resources, including household and public expenditures, available to the children in each wealth quintile. We look at both household expenditures and government spending per student to examine the level of education resources that children in each wealth quintile have to their disposition. Whenever possible, we focus on the smallest administrative unit to get a better sense of the extent of disparities in education resources across the case countries. It is likely that participation rates among the poorest are lower than among the wealthiest and the wealthiest disproportionately benefit from public spending on education. Moreover, the differences in the households’ ability to contribute to the child’s education and pay for any fees, transportation, or school materials may exacerbate the disparities in the total education resources available to a child. We examine the how *severe* the disparities are across the wealth quintiles in the case countries.

3.4 Research Question 3

How does the cost of school participation affect attendance decisions among households? Do attendance decisions in relation to potential household spending on education vary by wealth quintile?

We draw our analytic data from the World Bank’s Living Standards Measurement Surveys (LSMS) for Ethiopia, Malawi, and Uganda where we empirically test that education costs are a significant deterrent to school participation. The LSMS enables us to observe exact educational expenses incurred by each household per school attending child. We use household educational expenditure information to determine the expected cost of school participation in each subnational region/district.¹

¹ We compute the expected cost of school participation as the mean of total household expenditures, by subnational region/district, denoted by \bar{C}_g .

Although the cost of school attendance is theoretically negatively associated to school attendance decisions, we argue that the cost of school attendance is endogenous in empirical data. It is likely that subnational regions/districts where the cost of attendance is high are the same regions that have a disproportionate share of households from the top of the wealth distribution who are more likely to send their children to school regardless of cost. In other words, comparing differences in attendance behavior between subnational regions with varying levels of attendance cost would yield biased results and overestimate the true relationship between cost of schooling and attendance decisions.² As such, this poses a challenge to identifying the true effect of an increase (decrease) in the cost of schooling on households' decision to enroll their children in school.

Chetty, Hendren, and Katz (2016) show that children from high-poverty families who live in low-poverty neighborhoods are more likely to exhibit improved academic achievement and postsecondary attendance rates in large cities in the United States. We have reason to believe that this type of peer effect can manifest itself in other country contexts when high-poverty households reside in subnational regions/districts that are more affluent. As a result, we would expect that the statistical relationship, at face value, between expected cost of school attendance and school participation to run counter to theoretical predictions. This means that, empirically, we are likely to observe a positive relationship between attendance costs and attendance decisions because attendance rates in 'expensive' districts is higher. Again, this is a source of bias since the positive relationship is not because of the cost but due to factors other than the costs themselves.

To isolate the effect of the cost of school attendance from the confounders mentioned in this section, we exploit changes in tuition costs as children transition from primary to secondary school, i.e. between eighth and ninth grade in Ethiopia and Malawi, and between seventh and eighth grade in Uganda. In each of the countries analyzed in this study exhibit unique discontinuities in the cost of school attendance between the end of primary school and the start of secondary school. Specifically, these countries provide primary education virtually free of charge while secondary education imposes a relatively substantial tuition fee for enrollment. As a result of this unique variation in the cost of attendance, we are able to draw upon comparisons from within districts rather than between districts and eliminate the influence of the confounding factors discussed earlier in this section. In the formal econometric literature, we employ what is called a regression discontinuity design.³ This

² Ethiopia, Malawi, and Uganda have all implemented universal primary education through their educational systems. However, Uganda is the only country in our study who has enacted universal secondary education, as of 2011.

³ This strategy is similar to Moussa and Omoeva (2016) where the authors estimate the effect of tuition on grade progression in Malawi.

design enables us to draw comparisons between two otherwise similar groups who fall on opposite sides of a substantial change in tuition.

Given our empirical strategy, we restrict the analytic sample to only those children who are currently attending grades that are just above and just below the tuition change cutoff.⁴ Moreover, current 7th graders will be facing a lower expected cost of schooling than current 8th graders as a result of universal primary education, whereas 8th graders who are potentially transitioning to secondary school will now face a stricter budget constraint with the introduction of tuition fees into the expected cost of school attendance. The samples of current 7th and 8th graders are balanced along their observable characteristics, meaning that the sample of children who are facing different levels of tuition are similar in their observed attributes. This ensures that the RD design is able to viably isolate the effect of cost of school attendance on school attendance (Imbens and Lemieux, 2008; Lee and Lemieux, 2010).⁵ We note that it is likely that our estimates are not causal, however, we are able to estimate unambiguous effects with less potential for bias.

Finally, we stratify our analysis by wealth quintile to determine whether tuition effects are heterogeneous across different portions of the wealth distribution. This strategy enables us to estimate the responsiveness, in terms of school participation, of households in different wealth quintiles to changes in tuition fees. As such, we expect that better off families to be less responsive to changes in cost, while poorer families to be more responsive. We argue that this expectation is due to the notion that changes in expected tuition fees are much more substantial relative to poorer families' household budget than richer families'.

3.5 Limitations

3.5.1 Data Limitations

Both administrative and household survey data used in this report have their weaknesses. Data on government education spending is often reported without much explanation of how financial education resources are distributed and without definitions of indicators used; and thus, there is a risk of researchers misinterpreting officially published finance information due to their lack of in-depth knowledge of countries' education finance process. For example, the private education sector may be to some extent subsidized by the government but that information may not be provided in financial reports leading to the assumption that the total

⁴ For Uganda, we will restrict the analytic sample to those children currently attending 6th and 7th grade as primary school ends in 7th grade, whereas 8th grade is considered lower secondary school.

⁵ We will rely on propensity score matching to ensure sample balance if the 7th and 8th grade samples are unbalanced along the different elements of X_{it} .

government spending on education is dedicated to public school only. Moreover, there is little we can say about the quality and reliability of the reported data.

As for household survey data, LSMS survey samples are relatively small, which makes analyzing specific subpopulations somewhat cumbersome. This issue is further exacerbated when stratifying the data by district and grade level, in which case the cell sizes would be small. Second, data collected from households in Ethiopia, Malawi, and Uganda regarding school enrollment and education related spending are not standardized across the three countries. Moreover, Ethiopia and Malawi do not ask respondents about their school attendance from the previous year, only the current year, which makes it difficult to assess whether a child has dropped out, repeated the grade, or progressed from one year to the next. As a result, we compute net attendance by grade level and use this indicator as the outcome variable of interest in our regression analysis in Ethiopia and Uganda. Lastly, we note that household spending on education related activities and purchases are not uniform across our case study countries. For example, the LSMS from Ethiopia only included four questions about education expenditures, while the LSMS from Malawi included nine questions, and the LSMS from Uganda included seven questions. As such, it is important to be mindful of drawing any cross-country comparisons even though all indicators are measured on the same scale.

3.5.2 Methodological Limitations

We identify several methodological limitations related to regression analysis that we use to address Research Question #3. Specifically, our identification strategy falls short of the experimental ideal in the aims of identifying the causal links between changes in the cost of attendance and actual attendance behavior among eligible children.

We attempt to mimic an experiment by comparing otherwise similar children along their observed characteristics but face different levels of expected cost of attendance. We note, again, that the source of variation in the cost of attendance is coming from the fact that primary education is supplied universally in each of the case study countries, whereas secondary education is not free of charge. Although we are able to balance the sample of children on either side of the cost cutoff, we are still not able to fully account for differences in unobservable factors between children facing little to no cost of attendance relative to children facing substantial tuition fees. We are also not able to fully account for the decision making process related to enrollment in secondary school. While our ability to balance the sample on background characteristics allows us to zoom in on cost of attendance, there may be other factors that influence the choice to transition to secondary, such as the level of academic rigor, the expected job prospects for secondary school graduates in a given locality, or perception of relevance of secondary school education. Children who are currently

enrolled in eighth grade, for instance, may have higher innate levels of academic aptitude relative to similar children enrolled in seventh grade. This means that comparing the two groups of children may lead to an underestimate of the true effect of rising costs on attendance behavior. On the other hand, it is also possible that the degree of relative academic rigor in eighth grade is higher than it is in seventh grade, which could lead to an overestimate of the true effect.

Given these unobserved factors that we are unable to account for in our regression model, we cannot fully make causal claims and the potential net bias is ambiguous in direction. However, the empirical strategy we employ in this study mitigates a large amount of bias although not entirely.

4 Case studies:

4.1 Malawi

- Education related costs make up about 1% of total expenditures in households with primary school attending children. Households with children attending secondary school, which is not free, spend about 4.5%.
- The cost of attending public secondary school is about 16 times higher than the cost of attending public primary schools, and private education costs 10 and 3 times more than public education at primary and secondary levels, respectively.
- Families with children attending public primary schools spend most on school uniforms and school supplies, which, notably, are not much less expensive than supplies and uniforms in private schools.
- The costs of attending public secondary are more than the costs of private primary, demonstrating that attending secondary school would likely not be affordable for the majority of the Malawi population even if more children were able to pass the Primary School Leaving Examination (PSLE) offered at the end of primary school.
- Although the total amount of public education funding is highly correlated with the number of students at the subnational level, per pupil spending varies across districts, with some receiving twice as much per student as others. No clear patterns between poverty levels and per pupil spending can be identified across districts at either primary or secondary level.
- An average primary school age child in the wealthiest quintile has about 1.5 times more education resources than a child of the same age in the poorest quintile, while at the secondary level, the wealthy child has about 5 times more education resources.
- **Eliminating all out-of-pocket expenses on education from households would increase the likelihood of school attendance by about 26 percent.**
- **Eliminating household expenses on education entirely among the poorest two quintiles would increase the likelihood of school attendance by 43 and 54 percent, respectively.**
- **The effect sizes are similar when examining the effect of tuition fees.**

4.1.1 Context

Malawi is a landlocked country in southeastern Africa with a population estimated at about 17 million in 2015, and about 10 million under the age of 20 (UNPD, 2015). With about 71% of people living on less than \$2 per day, high HIV prevalence and low urbanization, Malawi has one of the highest poverty rates in the world and ranks low on social and human development (World Bank, World Development Indicators, 2015). The country is divided into 34 districts placed within the Northern, Central and Southern regions. Among the three,

the Northern region is the least urbanized and the least densely populated, being home to only about 13% of the Malawi's population, with the remaining 45% and 42% percent living in the Southern and Central regions, respectively (World Bank, 2012).

The Malawi education system is structured into 8 grades of primary and 4 years of secondary education. Based on LSMS data, about 89% of all primary school enrollment are in public schools and 11% are in private and other non-public schools, while the proportion of secondary enrollment in public and private schools can be estimated at 72% and 28%, respectively. In 1994, Malawi abolished school fees for primary education which resulted in an immediate increase in school enrollment in the first 8 grades by about 50% from 1,895,423 in 1994 to 2,860,081 in 1995 (Government of Malawi, 2012). In the recent years, the number of students in primary schools has reached over 4 million, with the pupil teacher ratios reaching more than 60 in almost all districts. Overall, the Malawian primary education system demonstrates low internal efficiency, with repetition rates in the first four grades of primary education at about 20% and as many as 12% of students dropping out of school at every grade of primary education (Government of Malawi, 2012).

Family reasons and long distance to school are often cited as reasons for dropping out, but with about a third of cases categorized as dropouts for "other reasons" it is not possible to get a complete picture of whether high dropout is more demand or supply driven. Certain patterns across regions become apparent, however, with many more girls leaving school in the Northern districts due to marriage and pregnancy than in districts located in the rest of the country. Even those children in Malawi who stay in school longer do not learn enough: according to the most recent published SACMEQ data, about 37% of grade 6 students in Malawi does not achieve even basic reading skills, defined as reading with an ability to interpret meaning (SACMEQ, 2007).

The secondary education in Malawi is not cost free and enrollment remains low as compared to primary education, at about 260,000 secondary school students in 2012 (Government of Malawi, 2012). In order to be admitted to secondary, a student must pass the Primary School Leaving Examination (PSLE) offered at the end of primary school. In 2012, the passing rate for PSLE was about 69%. Not everyone who passes the exam is able to attend. The EMIS data shows that in 2011, about 141,646 students successfully completed the PSLE. The number of students in the first grade of secondary, however, was registered at 67,823 in the following year (Government of Malawi, 2012).

According to the 2012 EMIS report, spending on education constitutes about 20% of the total recurrent government expenditures in Malawi. About 53% of education resources are dedicated to primary, and about 14% goes to secondary (Government of Malawi, 2012).

4.1.2 Results

4.1.2.1 What are the patterns in public and household spending on education at the subnational level within Malawi?

Household spending

Even though fees for public primary education in Malawi have been abolished, households still encounter numerous costs associated with school attendance at the primary level. Additionally, some families chose to send their children to private schools, which is often associated with steep tuition fees. As Table 1 shows, education related costs make up about 1% of total expenditures in households with primary school attending children. Households with children attending secondary school, which is not free, spend about 4.5%.

Across Malawi, households spend the highest share of their expenditures on education in urban areas (1.7%), and in the South (1.2%) region. The poorest dedicate 1.1% of their spending to education and the percentage declines with each quintile highlighting the disproportionate financial burden that primary school attendance places on the most economically disadvantaged; and increases for the wealthiest (1.3%) who are most likely to afford increasing their spending on education costs without sacrificing their basic needs.

Given that secondary education in Malawi is not fee-free, we expect that most of the households with post-primary attendees are from relatively wealthier households. Indeed, as Table 1 demonstrates, the number of households with secondary school related costs increases with each wealth quintile. For the poorest quintile, which is the least likely to have a secondary school attendee, these costs are the highest share of total household expenditures (5.5%).

Table 1 Education expenditure per household in Malawi, nominal and as % of total household spending, of by region, area, and wealth

		Primary			Secondary		
		annual (MWK)*	% of household expenditures	N	annual (MWK)	% of household expenditures	N
National		2,565	1.00%	7,155	21,725	4.50%	1,387
Region	Central	2,385	0.80%	2,598	22,428	4.50%	473
	North	1,920	0.80%	1,433	19,734	5.20%	377
	South	2,943	1.20%	3,124	21,849	4.40%	537
Area	Rural	1,314	0.60%	5,991	15,065	4.50%	905
	Urban	9,685	1.70%	1,164	37,275	4.60%	482

Wealth Quintile	Poorest	1,026	1.10%	1,383	6,372	5.50%	106
	Quintile 2	1,076	0.70%	1,501	8,527	5.10%	174
	Quintile 3	1,279	0.60%	1,484	11,647	5.00%	251
	Quintile 4	1,526	0.50%	1,452	16,273	4.90%	334
	Wealthiest	8,522	1.30%	1,335	37,091	4.30%	522

Source: 2011 Malawi LSMS

* In 2011, one Malawi Kwacha was equivalent to 0.006 USD

We explore the differences in average annual spending per school attending child, shown in Malawi Kwacha (MWK), by looking at a range of subnational dimensions in Table 2. At the national level, the cost per child attending school is about 623 MWK for public education and about almost 10 times higher (6,074 MWK) for private education. The cost per secondary school attending child reaches 9,784 MWK for public and 33,209 MWK for private secondary school.

There are no big differences in the costs of public primary school attendance for boys and girls. For private primary schools, the costs per female child are much higher (7,879 MWK per girl versus 4,245 MWK per boy), suggesting that private schools for girls may be more expensive. Such significant gender differences are not seen at the secondary level; quite the opposite, on average families spend more on boys than on girls attending secondary school.

An interesting pattern is revealed across regions with private schools being significantly cheaper in the Northern region, which is also a place where families pay higher costs for public education, especially at the secondary level.

Across all levels and sectors, there are quite significant disparities in education costs between rural and urban areas, with primary school attendance in urban areas costing families twice as much for public schools, and 23 times as much for private education. As seen in Table 1, these higher costs result in education spending making up a higher share of total household spending in urban areas.

As expected, the differences in average spending per child attending school are also significant across the five wealth groups. Interestingly, the poorest spend similarly on children attending private and public school. This suggest some relatively inexpensive private school options available to them, or possibly a scholarship or cash transfer that are not considered part of total household expenditures.

Table 2 Annual household spending per school attending child in Malawi, by gender, region, urban/rural, wealth quintile and religion (MWK)

		Primary				Secondary			
		Public	N	Private	N	Public	N	Private	N
National		623	13,885	6,074	1,670	9,784	1,397	33,209	524
Gender	Female	634	6,909	7,879	861	10,029	622	31,292	273
	Male	611	6,976	4,245	809	9,587	775	35,450	251
Region	Central	663	5,229	6,335	497	11,711	494	36,095	144
	North	622	2,741	1,275	679	10,580	394	20,632	161
	South	580	5,915	13,136	494	7,192	509	36,605	219
Area	Rural	545	12,024	1,203	1,169	9,346	992	18,530	238
	Urban	1,128	1,861	27,135	501	11,166	405	50,041	286
Wealth Quintile	Poorest	437	3,075	495	345	4,775	102	7,285	26
	Quintile 2	478	3,100	705	264	6,301	189	7,547	39
	Quintile 3	558	3,049	746	325	7,818	280	10,551	69
	Quintile 4	695	2,651	1,470	284	10,164	379	18,219	112
	Wealthiest	1,121	2,010	22,070	452	13,238	447	51,131	278
Religion	Christianity	635	11,732	7,011	1,418	10,001	1,266	35,157	487
	Islam	548	1,546	2,650	164	8,298	93	9,636	29
	None	631	378	540	37	9,672	18	30,106	2
	Other	647	78	610	34	5,020	11	29,817	4
	Traditional	571	151	890	17	6,426	9	8,366	2

Source: 2011 Malawi LSMS

To determine the nature of school related expenditures, we look at the different types of spending that families with school attending children encounter (Figure 1). By far, school fees are the highest expense at all levels and sectors with the exception of the free primary education. Families with children attending public primary schools spend most on school uniforms and school supplies, which, notably, are not much less expensive than supplies and uniforms in private schools. Most striking, the costs of attending public secondary are higher than the costs of private primary, demonstrating that attending secondary school would likely not be affordable for the majority of the Malawi population even if more children were

able to pass the Primary School Leaving Examination (PSLE) offered at the end of primary school.

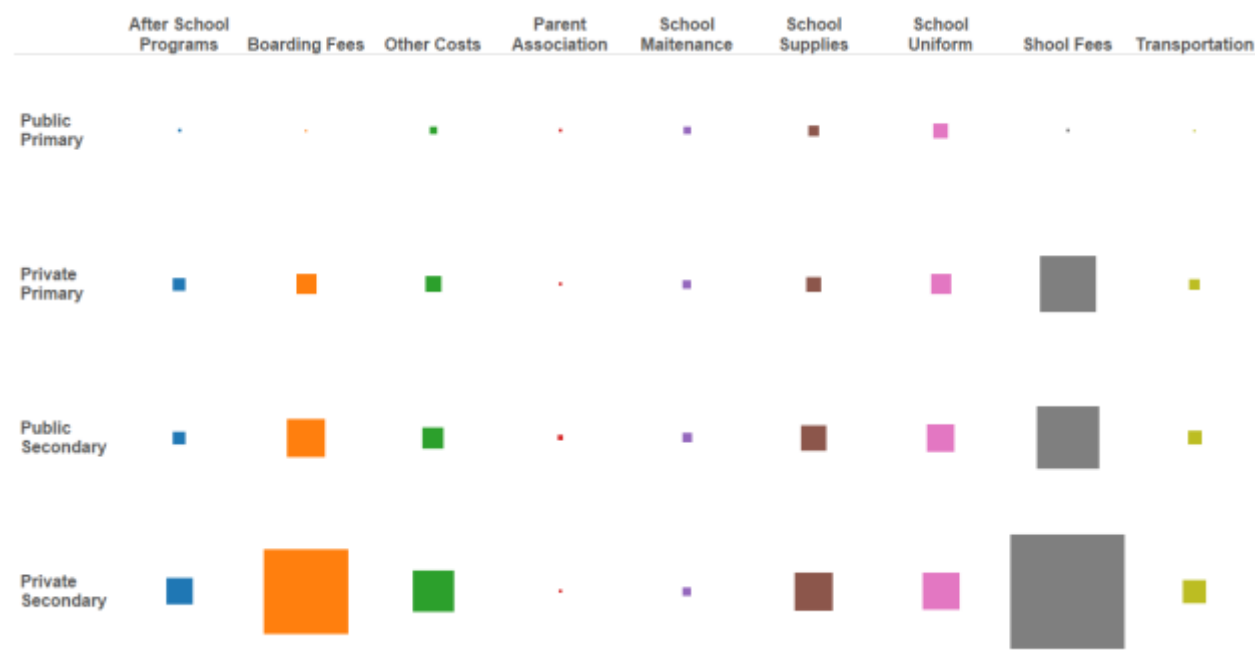


Figure 1 Annual household spending per school attending child in Malawi, by type of expenditure
Source: 2011 Malawi LSMS

Government spending

The Education Statistics 2012 report published by the Malawi's Ministry of Education, Science and Technology serves as the main source of administrative education data in this section (Government of Malawi, 2012). The report presents district (for primary) and region (for secondary) level information on the number of students in both public and private schools, available resources including teachers, schools, and classrooms, as well as efficiency rates by grade (promotion, repetition and dropout). Finally, it provides information on recurrent spending on education by district/region, which we then divide by the number of students in each district/region to calculate per student spending. On average, about 88% of recurrent expenditures are teacher salaries. Assuming that salaries do not differ much across regions, total recurrent expenditures can then be expected to highly correlate with the pupil teacher ratio, with higher per pupil spending observed in districts with better ratios of teachers per pupil.

Figure 2 shows that while the total amount of funding is highly correlated with the number of students in each district, per pupil spending varies across districts, with some of them receiving twice as much per student as others. Even though none of the districts receives less

than 4,000 MKW per student, it seems that higher per pupil spending is more likely in districts where the number of students is lower.

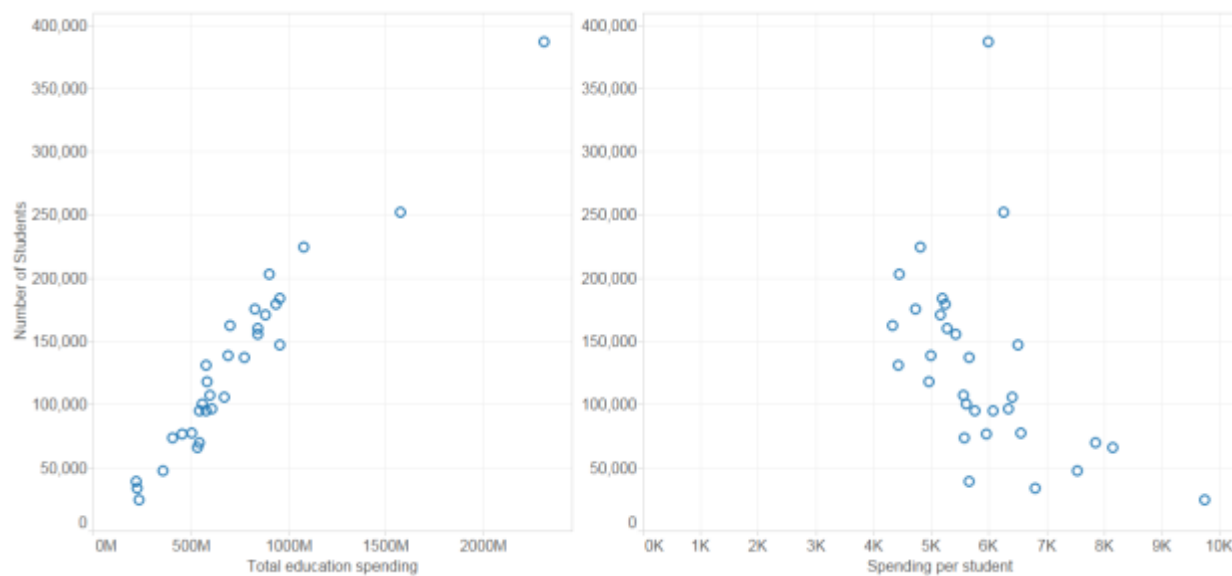


Figure 2 Total and per pupil spending on primary education across districts in Malawi (MWK)

Source: 2012 Malawi EMIS

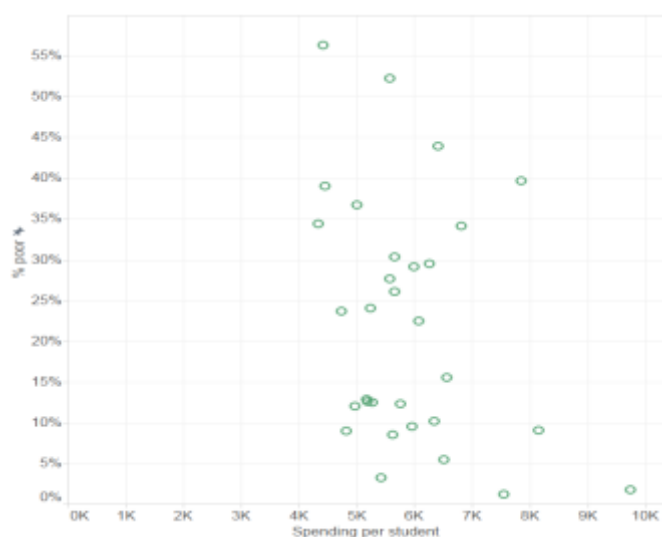


Figure 3 Spending per primary student (MWK) versus need in Malawi

Source: 2012 Malawi EMIS; 2011 Malawi LSMS

We then compare per pupil spending across the regions to the percentage of people from the poorest wealth quintile (Figure 3). The poorest are least likely to afford substituting inadequate levels of government education spending with their own resources, and therefore, an argument could be made that poorest regions should receive more funding per pupil. Based on Figure 3, that is not the case, and no clear relationship between poverty level and per pupil spending can be observed.

While we do not have district level information on enrollment and spending on secondary, we are able to compare data across six administrative regions in Malawi: Northern, Central Eastern, Central Western, Southern Eastern, Southern Western, and Shire Highlands. As we see in Figure 4, spending per student ranges roughly from 28,000 MWK in the Southern Western region to 18,000 MWK in the Northern Region, which also has the second highest number of students. Comparing the percentage of poor in each region to per student spending reveals that the region with second highest average poverty rate, Southern Western, receives the highest per student funding for secondary education. Overall, however, no clear pattern between the percentage of poor and per student spending can be identified.

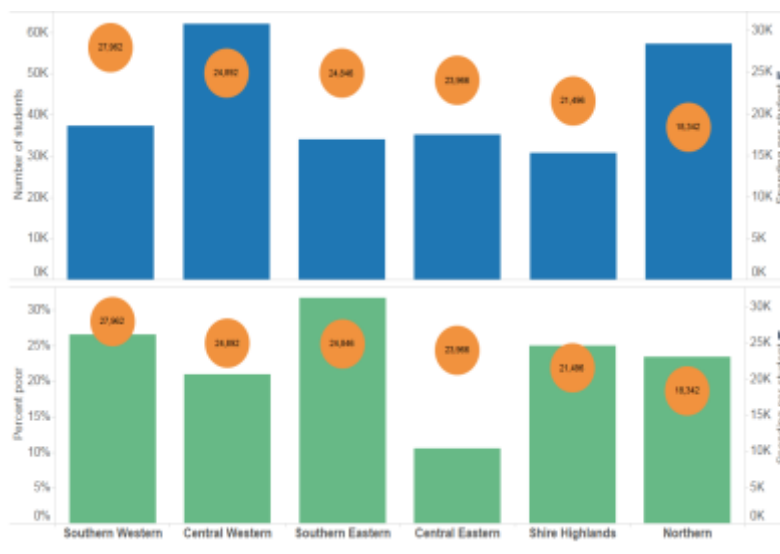


Figure 4 Spending per secondary student versus need in Malawi

Source: 2012 Malawi EMIS; 2011 Malawi LSMS

4.1.2.2 Are education resources available for school-aged children distributed equitably across wealth quintiles and subnational regions?

In the first section, we contrasted government spending at the subnational level with indicators of “need” such as the percent of poor. Here we focus on equity further by examining both public and private spending per child across wealth quintiles in each district and estimating the levels of disparities in resources between the poorest and the wealthiest across Malawi.

In order to estimate the amount of government resource available per child in each wealth quintile by district, we calculate attendance rate of primary age children in public schools by wealth quintile and multiply that by per pupil funding in each district. If attendance in a given quintile is higher, it is assumed that a child from that quintile receive a higher share of the available resources.

Figure 5 demonstrates that, on average, public resource per child in the poorest wealth quintile are the lowest, followed by the wealthiest quintile. The former can be explained by

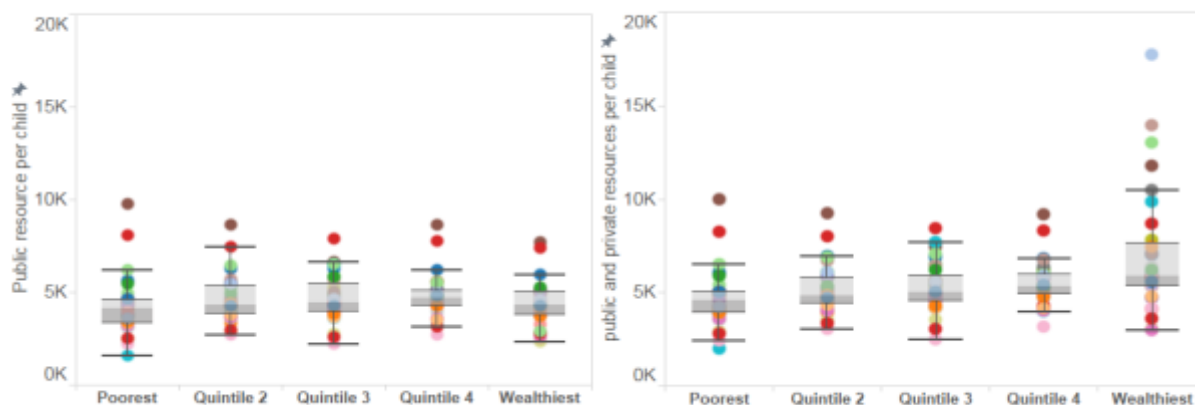


Figure 5 Public and total education resources per primary school age child in Malawi

Source: 2012 Malawi EMIS; 2011 Malawi LSMS

lower attendance rates among the poorest, and the latter by the fact that children from affluent families are more likely to attend private education and as such, are not direct recipients of government resources. Overall, the disparities between different wealth quintiles within the same district are less notable than the differences between the same wealth quintiles across districts.

The true disparities in education resources available per child in each quintile arise from the differences in household spending, particularly due to high levels of education spending in the wealthiest quintile. In order to account for household's ability to contribute to their children's education and substitute for inadequate levels of government funding, we calculate average household spending per child attending school (including both public and private sector), and add that value to average government spending per child. The graph on the right side of Figure 5 shows that incorporating household spending to the total amount of resources available to a child makes the biggest difference, unsurprisingly, in the wealthiest quintile, which becomes clearly most advantageous in terms of access to education resources. A primary school age child in the wealthiest quintile has about 1.5 times more education resources than a child of the same age in the poorest quintile on average, but a great variability across the provinces can be observed.

We conduct the same analysis for secondary education (Figure 6), looking at six administrative regions in Malawi, due to data on government spending per district not being available at the post-primary level. Secondary school attendance among the poorest is low, which is why government resources are disproportionately benefiting the wealthiest. On average, the government spends 7 times more per a secondary school age child in the

wealthiest quintile than per a secondary school age child in the poorest quintile. There is a large variation in private spending between the same wealth quintiles across different regions. On average, when household spending is incorporated, our estimates indicate that

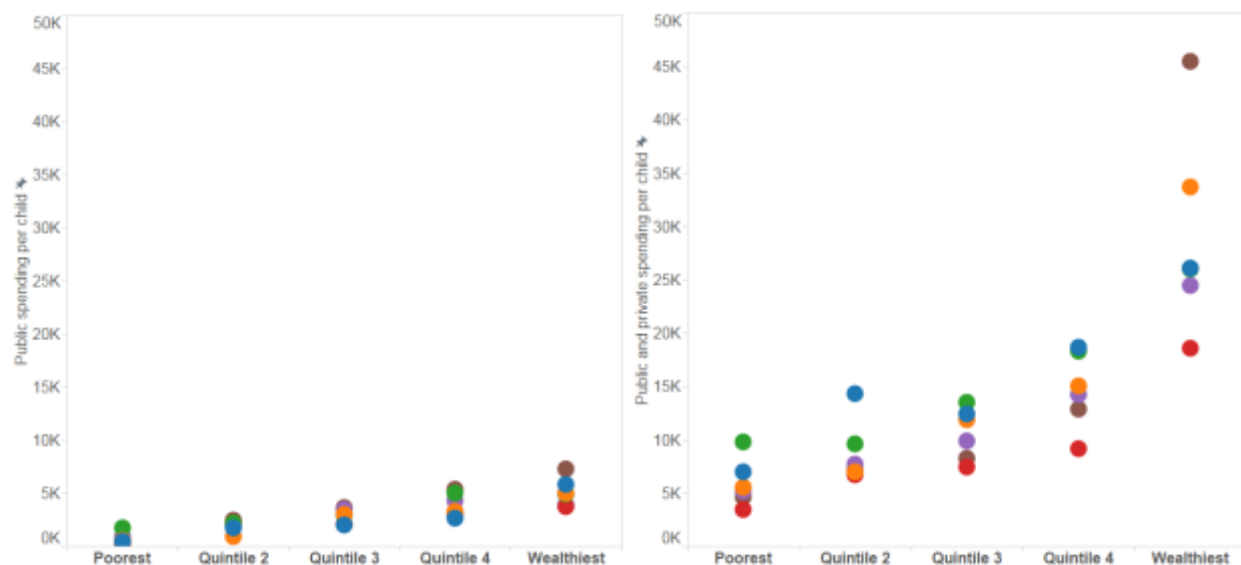


Figure 6 Public and total education resources per secondary school age child in Malawi

Source: 2012 Malawi EMIS; 2011 Malawi LSMS

a secondary school age child in the wealthiest quintile has 5 times more resources invested in his or her education, with a significant variation across the regions.

4.1.2.3 How does the cost of school participation affect attendance decisions among households? Do attendance decisions in relation to potential household spending on education vary by wealth quintile?

Methodological adjustments

In this section, we address the third research question regarding the effect of expected household expenditures when households are facing the decision to enroll their child in school. To quantify the effect of potential upcoming household expenditures on school enrollment, we follow the empirical strategy outlined in the methodology section (Appendix) and estimate equations [9] and [10].

Moreover, because we want to isolate the effect of upcoming expected educational expenditures on enrollment, we limit our analytic sample to similar children who are observed in a period where their upcoming expected cost of attendance is not expected to rise and children, over the same period, whose expected cost of attendance is expected to rise. Specifically, we limit our sample to two groups of children those who attended 7th grade and 8th grade in the year prior to the LSMS interview. The former group faces the decision to

enroll in 8th grade where the expected cost of attendance does not change, while the latter group are facing the decision to enroll in 9th grade where the expected cost of tuition is expected to increase substantially. As a result, we are able to isolate the effect of an increase in expected costs and tuition on households' decision to enroll their child in the appropriate subsequent grade level.

Figure 7 illustrates our identification strategy. The first panel of Figure 7 plots the total expected cost and the expected tuition fee for each primary school grade level as well as for each secondary school grade level. As discussed earlier in the methodology section, total expected cost and expected tuition are computed as the district average for each grade level across Malawi. It is clear from the cost of education per grade level that there is a substantial increase in the expected cost of secondary school enrollment relative to primary school enrollment. The expected total cost of attendance in 8th grade is about 2,090 MWK whereas that number increases to 8,586 MWK in 9th grade. Similarly, expected tuition fees increase from approximately 403 MWK in 8th grade to 4,204 MWK in 9th grade.

The second panel of Figure 7 displays the mean progression rate for each grade level in primary and secondary school coupled with a simple trend line for primary and secondary school, separately. Similar to the plot in the first panel, we observe a discrete decline in grade progression rate when students are transitioning from primary to secondary school. We exploit variation in the expected cost of attendance between children transitioning to secondary school and similar children in a slightly earlier stage of their education enables us within district to isolate the effect of cost of attendance from potential confounders that exist between districts.⁶ Therefore, this strategy will enable us to provide evidence that the pecuniary costs associated with schooling (tuition and otherwise) act as a significant entry barrier to school participation.

⁶ Our empirical strategy accounts for potential selection bias stemming from between-district differences in cost of attendance. For example, attendance may be more costly in affluent districts but also associated with higher attendance and grade progression rates.

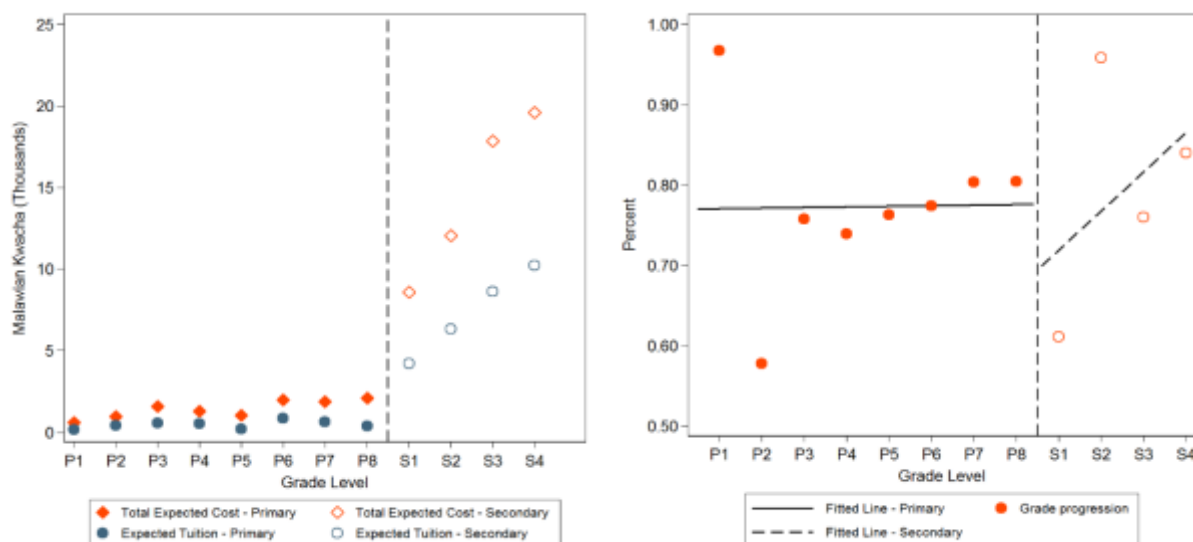


Figure 7 Average cost of education and grade progression rate in Malawi, by grade level
2011 Malawi LSMS

Findings

Table 3 presents the regression estimation results where the outcome variable is the probability of enrolling in the subsequent grade level and the explanatory variable of interest is the total expected cost of attendance. The first three columns of Table 3 denote estimation of equation [9] under various regression specifications. The first is a naïve regression of the expected total cost of attendance on the likelihood of attending the next grade level. The second runs the same model but with the inclusion of student and household characteristics as control variables. The third column includes district-level fixed effects in addition to the observable control variables.

Across all specifications, we find that an increase in the total expected cost of school attendance acts as a statistically significant barrier to enrollment in subsequent grades (secondary school for the case of Malawi). Specifically, using results from within district variation in expected attendance cost (column 3) we estimate that a 1,000 MWK increase in total cost of attendance is associated with a 2.1 percentage point decline in the probability of enrolling in the next grade. Relative to the average progression rate of 56.8 percent for students in 8th grade and a 7,000 MWK difference in expected cost between 7th and 8th grade, the effect size translates to a decrease in probability of enrollment by 25.8 percent. All estimated coefficients associated with cost of attendance are statistically significant at the 1 percent level.

Lastly, the fourth column stratifies the effect of total expected cost of attendance by wealth quintile to determine whether there are heterogeneous effects across wealth groups. It is important to note that the first two columns identify the effect of attendance costs by comparing progression rates between districts with varying average costs, while the last two columns rely on comparing similar students in the same district who face varying levels of attendance costs. Because there are external factors that render districts incomparable, such as peer effects, cost of living, and affluence, we argue that within district identification of the cost effect is more reliable and closer to the true effect than between-district identification.

We find that households in the bottom two quintiles of wealth are the most susceptible to changes in the expected cost of school attendance. Moreover, we estimate between a 3.1 and 3.9 percentage point decline in the likelihood of attending the next grade level associated with a 1,000 MWK increase in expected costs. On the other hand, a 7,000 MWK increase in schooling costs lower the probability of enrolling in the next grade by between 1.5 and 1.8 percentage points in the top two quintiles. To put the effect sizes into perspective, relative to mean grade progression, a 7,000 MWK increase in expected cost lowers the probability of enrollment in the next grade by 42.7 and 54.1 percent in the bottom two quintiles, respectively. Again, all estimated coefficients associated with cost of attendance for each wealth quintile are statistically significant at the 1 percent level.

Table 3 Probability of grade progression and total expected costs of attending the next grade level in Malawi

	(1)	(2)	(3)	(4)
Cost to Household:				
Total expected cost of attendance	-0.010*** (0.003)	-0.013*** (0.003)	-0.021*** (0.003)	
1st Quintile				-0.031*** (0.011)
2nd Quintile				-0.039*** (0.009)
3rd Quintile				-0.020*** (0.006)
4th Quintile				-0.018*** (0.004)
5th Quintile				-0.015*** (0.004)
Wealth Quintile Intercepts:				
2nd Quintile		0.031 (0.043)	0.064 (0.042)	0.101 (0.063)
3rd Quintile		0.021 (0.042)	0.051 (0.041)	0.009 (0.058)
4th Quintile		0.032 (0.041)	0.069* (0.042)	0.021 (0.058)
5th Quintile		0.047	0.085*	0.014

	(1)	(2)	(3)	(4)
Constant	0.736*** (0.016)	0.457* (0.263)	0.324 (0.275)	0.358 (0.264)
Control Variables	No	Yes	Yes	Yes
District Fixed Effects	No	No	Yes	Yes
Observations	1,495	1,474	1,474	1,474
R-squared	0.011	0.034	0.146	0.151

Notes: Coefficients are estimated via a linear probability model (LPM). Numbers in parentheses denote robust standard errors. Variables included under "Control Variables" are gender, age, parents' education, household size, religion, and urban location. Analytic sample restricted to students who attended primary grades 7 and 8 last year. Household cost figures are represented in local currency units (thousands of MWK). Asterisks denote statistical significance as follows. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

Table 4, below, follows the same strand of analysis as Table 3, earlier, but examines the effect of expected tuition fees alone rather than the total costs of school attendance. Again, across all regression specifications we find that higher tuition fees are associated with lower attendance rates of students' logical next grade level. Specifically, looking at within-district variation in tuition fees we find that a 1,000 MWK increase in tuition fees lowers the likelihood of enrolling in the next grade level by 3.8 percentage points, on average. This translates to a 6.7 percent decrease in the probability of enrolling in the next grade relative to the mean progression rate of 56.8 percent. Further, a 4,300 MWK increase in tuition fees, which is the average difference between primary and secondary school tuition, lowers the likelihood of enrollment by about 28.8 percent.

When disaggregating the effect of tuition costs by wealth quintile, we again find that the poorest two quintiles of wealth are the most susceptible to changes in expected tuition fees. We estimate that a 1,000 MWK increase in tuition lowers the likelihood of enrolling in the next grade by between 6.3 and 6.6 percentage points among children in the bottom two quintiles, respectively. Relative to a 4,300 MWK change in tuition and each group's mean progression rate, we predict that the probability of enrollment to decrease by between 53.5 and 56.2 percent for the lowest two quintiles, respectively. Lastly, we show that the effects of rising costs of schooling fees for the richest two quintiles are less severe. In this case, we predict that the probability of enrollment to decrease by between only 2.6 and 3.3 percentage points. These effect sizes translate to decreases of 17.8 and 23.9 percent for the top and fourth wealth quintiles, respectively.⁷

⁷ The relative effect sizes are computed in relation to the grade progression rate of each wealth quintile and a 4,300 MWK increase in tuition.

Table 4 Probability of grade progression and total expected tuition fees of the next grade level in Malawi

	(1)	(2)	(3)	(4)
Cost to Household:				
Expected tuition costs	-0.023*** (0.004)	-0.030*** (0.005)	-0.038*** (0.004)	
1st Quintile				-0.063*** (0.018)
2nd Quintile				-0.066*** (0.014)
3rd Quintile				-0.038*** (0.010)
4th Quintile				-0.033*** (0.008)
5th Quintile				-0.026*** (0.007)
Wealth Quintile Intercepts:				
2nd Quintile		0.036 (0.043)	0.065 (0.042)	0.081 (0.051)
3rd Quintile		0.025 (0.042)	0.052 (0.041)	0.019 (0.049)
4th Quintile		0.037 (0.041)	0.071* (0.042)	0.027 (0.049)
5th Quintile		0.054 (0.048)	0.090* (0.049)	0.026 (0.056)
Constant	0.739*** (0.014)	0.399 (0.260)	0.289 (0.268)	0.318 (0.260)
Control Variables	No	Yes	Yes	Yes
District Fixed Effects	No	No	Yes	Yes
Observations	1,495	1,474	1,474	1,474
R-squared	0.021	0.047	0.151	0.157

Notes: Coefficients are estimated via a linear probability model (LPM). Numbers in parentheses denote robust standard errors. Variables included under "Control Variables" are gender, age, parents' education, household size, religion, and urban location. Analytic sample restricted to students who attended primary grades 7 and 8 last year. Household cost figures are represented in local currency units (thousands of MWK). Asterisks denote statistical significance as follows. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

4.2 Ethiopia

- Households with children enrolled in primary education spend about 1.1% of their total household expenditures on costs related to school attendance. By far, the highest spending on primary education can be observed in Addis Ababa (6.6% of total household expenditures) where the highest percentage of children is enrolled in private schools (52%, versus 6% in the rest of the country).
- The cost of attending public secondary school is about 4 times higher than the cost of attending public primary schools, and private education costs 15 and 11 times more than public education at primary and secondary levels, respectively.
- There is a high variability in per student spending across the regions, with some regions receiving 11 times more resources per student than others, and cities receiving more funding per student than rural areas.
- Dire Dawa, Addis Ababa, and Harari, three cities receiving the highest per student spending for both primary and secondary education, have the lowest portion of the population in the lowest wealth quintile.
- A primary age child in the wealthiest quintile has 1.6 times more education resources than a primary age child in the poorest quintile.
- **If households were not expected to spend any amount of money on schooling, we predict that net secondary attendance rates would increase by 85 percent, from 5.4 percent to 9.9 percent.**
- **The poorest quintile would experience an 87 percent increase in net attendance, while the second poorest would experience a 46 percent increase in net attendance from eliminating all education out-of-pocket expenses.**
- **Eliminating tuition fees alone, would only increase net attendance by about 6 percent.**

4.2.1 Context

With 97 million people, Ethiopia has the second highest population in Sub-Saharan Africa (World Bank, 2015). The population is largely young, with 43% below the age of 15, and predominantly rural-dwelling, with 84% living in rural areas, where agriculture is the main economic activity (UIS, 2014; UNICEF, 2014). Ethiopia ranks low on the Human Development Index at 174 of 188 countries and is deeply impoverished, with per capita income below the regional average (UNDP, 2015; World Bank, 2015). Although repeated droughts and famines complicate and often compromise development, Ethiopia has experienced improvements in many areas, including education and public health, and has invested heavily in programs targeting the poor. Strong economic growth, averaging 11% per year in the decade leading up to 2014, has supported poverty alleviation efforts (World Bank, 2015).

The Ethiopian education system has an eight-year primary school cycle that is, in principle, compulsory. LSMS data show that about 94% of all children enrolled in primary school attend public schools and about 6% attend private schools, religious and other community schools, while at the secondary level the percentage of public enrollment is only slightly lower, at 91%. Into the 1990s, primary school enrollments in Ethiopia remained very low. In 1994, a few years after the end of a long civil war, the government abolished school fees for primary education with immediate growth in school participation a result. Gross enrollment rates at the primary level doubled from 25.5% in 1994 to 54.6% in 2000 and nearly doubled again to 100.1% in 2014 (source: UIS Data Centre).⁸

With a large youth population and rising enrollment, funding quality primary education has been an ongoing challenge, and schools must cope with textbook shortages, low teacher qualifications, and high pupil teacher ratios (Oumer, 2009; USAID, 2014). These difficulties are compounded by challenges reaching pastoralist populations, providing education to rural areas, and household pressures for children to work (UNICEF, 2014; Oumer, 2009). Educational outcomes in this context have been unsatisfactory. An Early Grade Reading Assessment (EGRA) conducted in 2010 revealed that primary students were unable to read at grade level and the results of national learning assessments suggest learning falls short of national standards (USAID, 2014). Internal inefficiency is also a problem, with only one in five students who begin school completing the primary cycle (Ethiopia Federal Ministry of Education, 2015).

In the final grade of primary school, students sit for regional examinations that determine eligibility for secondary school. According to the 2014 EMIS statistical abstract, approximately 1,009,000 students sat for the examination in 2014, of whom 79.4% were promoted to secondary school. The percentage promoted, however, ranges widely by region from only 54.1% in Afar to 95.3% in Oromia. Unlike primary, secondary school is not compulsory and government schools charge tuition fees. Enrollment at the secondary level, which last four years and is broken into two phases, remains low. According to the 2014 EMIS statistical abstract, gross enrollment stood at 39.3% in lower secondary and at 10.0% in upper secondary school in 2014.

In Ethiopia, about 25% of total government spending is devoted to education, a figure that has remained consistent in recent years (Ethiopia Federal Ministry of Education, 2014). Roughly 32% of education spending is devoted to primary education and 10% to secondary education (Ethiopia Federal Ministry of Education, 2015).

⁸ Although Ethiopia has eight years of primary school, estimates from the UIS Data Centre reflect only the first six years of primary school in Ethiopia, because UIS uses an alternative definition of primary school for the purposes of international comparison.

4.2.2 Results

4.2.2.1 What are the patterns in public and household spending on education at the subnational level within Ethiopia?

Household spending

For over 20 years now, children in Ethiopia have been able to attend public primary schools without paying fees. Still, as Table 5 shows, households with children enrolled in primary education spend about 1.1% of their total household expenditures on costs related to school attendance. By far, the highest spending on primary education can be observed in Addis Ababa (6.6% of total household expenditures) where the highest percentage of children is enrolled in private schools (52%, versus 6% in the rest of the country).

Across the wealth quintiles, spending on education ranges from 0.9% to 1.4% of total household spending. Even though the wealthiest spend three times more on primary education as the poorest, their primary education expenditures are the lowest share of total household spending across all income groups. It should be noted that the presented numbers show the total education spending within one household, regardless of how many children are attending school. The differences between groups can be further exacerbated, or mitigated, by the number of children among whom the spending is divided.

Secondary education in Ethiopia is not free, and we expect the costs associated with attendance at the secondary level to be higher due to the cost of fees in particular. Looking at Table 5, households with secondary school attending children are much rarer than households with children attending primary education and the sample sizes are very small, which raises concerns about the reliability of the estimates. It is nonetheless interesting to note that Addis Ababa is again significantly more expensive than in the rest of the country in terms of provision of secondary education.

Table 5 Education expenditure per household in Ethiopia, nominal and as % of total household spending, of by region, area, and wealth

		Primary			Secondary		
		annual (ETB)*	% of household expenditures	N	annual (ETB)	% of household expenditures	N
National	National	316	1.10%	2,770	692	2.40%	347
Region	Addis Ababa	2,350	6.60%	117	3,479	8.30%	26
	Afar	196	0.70%	78	374	1.80%	7
	Amhara	177	0.90%	514	424	2.20%	51
	Benshagul Gumuz	114	0.60%	76	218	1.20%	12
	Diredwa	696	1.70%	115	992	3.50%	10

	Gambelia	586	2.30%	76	515	1.60%	16
	Harari	345	0.50%	82	369	1.50%	7
	Oromia	292	0.80%	552	471	1.70%	71
	SNNP	242	1.10%	691	571	1.70%	101
	Somalie	325	0.90%	141	522	1.50%	17
	Tigray	231	0.90%	328	298	0.90%	29
Area	Rural	194	0.70%	1,955	441	1.70%	164
	Urban	1,277	3.30%	815	1,488	4.30%	183
Wealth	Poorest	145	1.40%	512	333	2.60%	43
	Quintile 2	224	1.40%	474	636	3.20%	56
	Quintile 3	225	1.00%	510	650	2.70%	52
	Quintile 4	358	1.30%	614	633	2.00%	83
	Wealthiest	624	0.90%	660	1,113	2.20%	113

Source: 2014 Ethiopia LSMS

* In 2014, one Ethiopian Birr was equivalent to 0.05 USD

Table 6 explores education spending in more detail, looking at the average cost of attending primary and secondary education per enrolled child. At the national level, the cost of primary school attendance is about 109 ETB for public schools and about 15 times higher - 1,685 ETB - for private schools. Particularly worth noting is the high cost of private primary schools in Addis Ababa, especially given that the demand for private schooling seems to be high with over a half of children enrolled in the private sector.

The sample size used in the calculations of public and private secondary school attendance is not sufficient when extracted at the subnational level, but we learn that on average, costs of attending public secondary school are more than 11 times higher than for public primary education.

Table 6 Annual household spending per school attending child in Ethiopia, by gender, wealth, region, urban/rural, wealth quintile and religion (ETB)

		Primary				Secondary			
		Public	N	Private	N	Public	N	Private	N
National		109	4,979	1,685	328	393	387	4,389	36
Gender	Female	111	2,431	1,369	153	392	195	5,148	23
	Male	107	2,548	1,973	175	394	192	2,687	13
Region	Addis Ababa	459	106	3,155	69	773	21	5,620	13
	Afar	86	187	110	8	342	8	0	0
	Amhara	77	864	2,038	24	339	59	1,887	1
	Benshagul Gumuz	61	142	270	1	169	15	0	0
	Diredwa	161	160	1,411	30	437	7	2,406	3
	Gambelia	136	181	1,505	13	352	22	0	0
	Harari	165	148	662	5	369	7	0	0
	Oromia	125	970	1,153	71	388	75	1,386	8
	SNNP	88	1,316	742	78	438	114	1,993	8

	Somalie	146	308	321	8	278	32	0	0
	Tigray	106	597	1,717	21	261	27	1,044	3
Area	Rural	96	3,880	404	33	364	207	0	0
	Urban	267	1,099	2,134	295	509	180	4,389	36
Wealth Quintile	Poorest	72	1,098	141	11	257	60	0	0
	Quintile 2	92	922	759	23	440	61	2,390	5
	Quintile 3	101	922	709	45	264	57	3,883	7
	Quintile 4	126	1,061	1,939	79	420	96	3,269	7
	Wealthiest	165	976	2,467	170	493	113	6,769	17
Religion	Muslim	92	1,548	1,438	72	411	106	2,304	12
	Orthodox	123	2,220	2,074	178	384	185	5,783	18
	Other	75	116	1,502	7	642	3	4,829	2
	Protestant	100	1,095	1,143	71	392	93	4,944	4

Source: 2014 Ethiopia LSMS



Figure 8 Annual household spending per school attending child in Ethiopia, by type of expenditure

Source: 2014 Ethiopia LSMS

The LSMS survey asks about education expenditures by grouping all non-fee costs such as books and uniforms, into a single question. Because of that, we are not able to analyze these costs separately, but we can compare them to the amount of any school related fees that households pay to secure attendance (Figure 8). As we can see, fees in private education are significantly more than in the public sector, at both primary and secondary levels. Non-fee related costs are also higher in the private sector.

Government spending

The main source of data on government spending for Ethiopia is the Education Statistics Annual Abstract 2005 E.C (2012-2013 G.C) which provides information on recurrent spending by region. For 6 out of 11 regions, the total recurrent spending is disaggregated by level, grouping primary and

junior secondary to one category, and secondary to another. On average, about 55% of total regional funding is dedicated to “primary and junior secondary” and 20% to “secondary”. Given that our analysis looks and primary and secondary education separately, we estimate that the 80% of “primary and junior secondary funding” is dedicated to just primary education (8 grades out of 10 grades that primary and junior secondary constitute together), while the remaining 20% is added to spending for secondary. As such, we assume that 44% of regional spending is dedicated to 8 grades of primary, and 30% is spent on secondary that includes both junior and senior secondary schools.

As Figure 9 demonstrates, the total funding for education increases with the number of students. There is a high variability, however, in per student spending across the regions,

with some regions receiving 11 times more resources per student than others, and cities receiving more funding per student than rural areas. In the calculations of per student spending, we assume that students in private schools are not recipients of public funding. If the private sector is in fact subsidized in some way by the government, and the subsidies are included in the budget figures, the disparities in regional funding presented in Figure 9 may

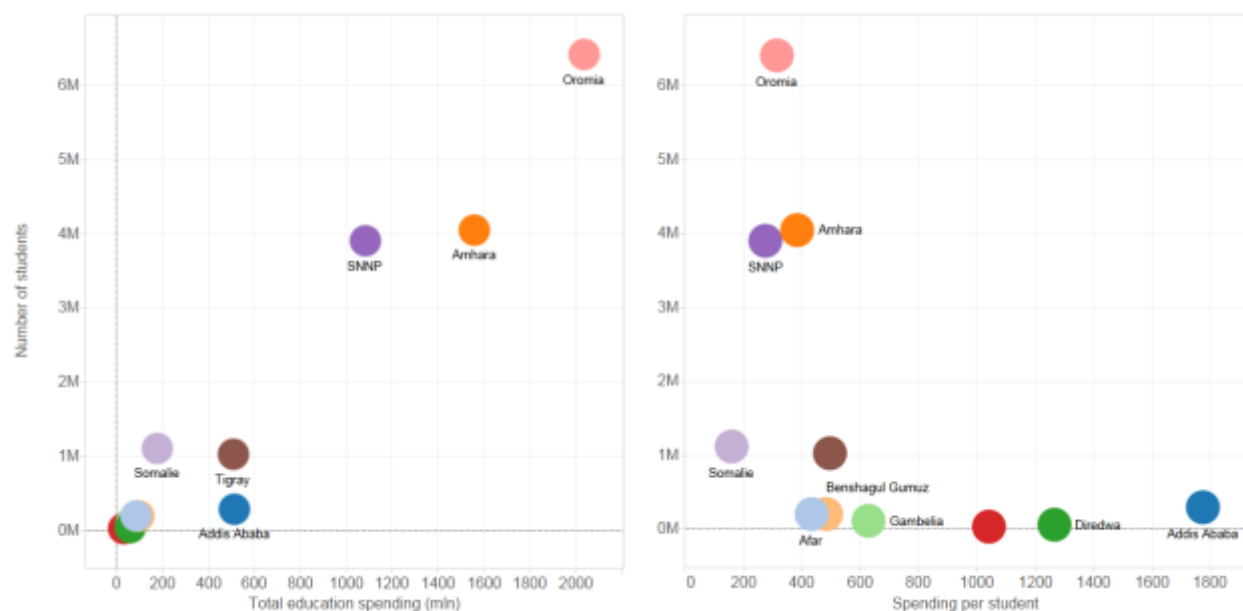


Figure 9 Total and per pupil spending on primary education across regions in Ethiopia (ETB)

Source: 2013 Ethiopia Statistical Abstract

be less significant.

Looking at indicators of “need” in Figure 10, we see that the regions receiving under 800 ETB per student show similar rates of out of school children (9% on average) but are quite different in terms of their populations’ income. Among these regions, the percent of poor ranges from 11% in Afar to about 40% in Benshangul Gumuz and Gambelia. Dire Dawa, Addis Ababa, and Harari, three cities receiving the highest per student spending, have the lowest portion of the population in the lowest wealth quintile, but the average out of school rates are comparable with the rest of the administrative areas.

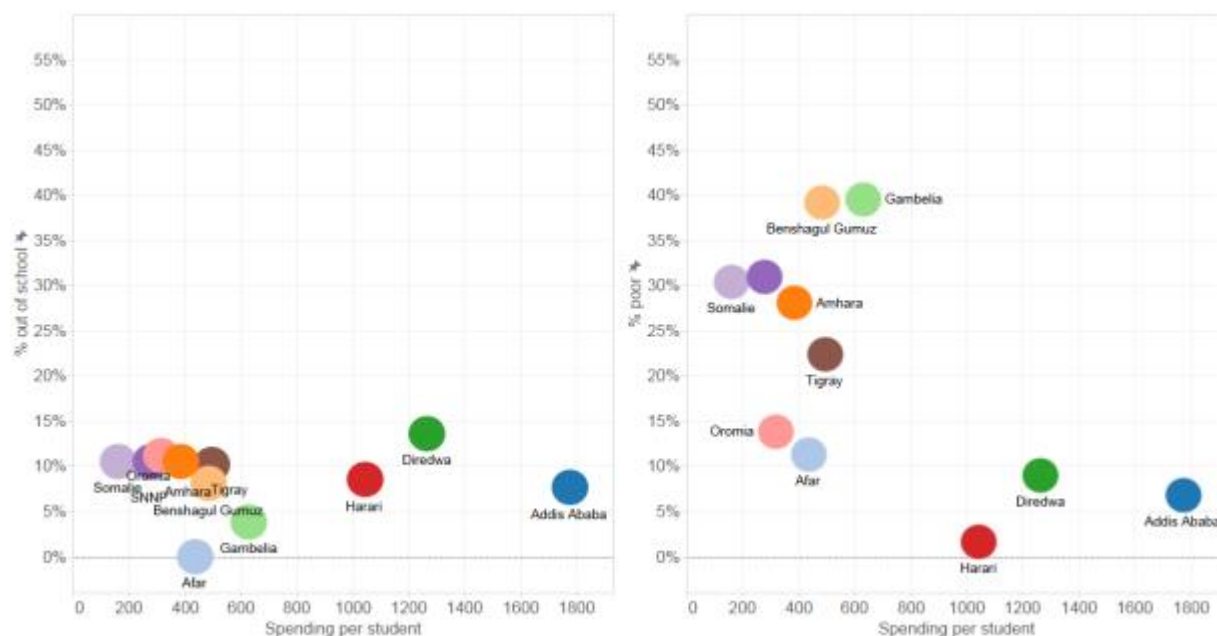


Figure 10 Spending per primary school student (ETB) versus need in Ethiopia

Source: 2013 Ethiopia Statistical Abstract, 2014 Ethiopia LSMS

Looking at secondary education (Figure 11) we see that, according to our estimates, spending per secondary student ranges from 1,900 ETB in Tigray to 7,255 ETB in Afar. Regions with the lowest number of students tend to receive higher funding per student while Oromia, with by far the largest number of children attending secondary (618,905 students in public schools) has the fourth lowest per student funding. The four administrative areas

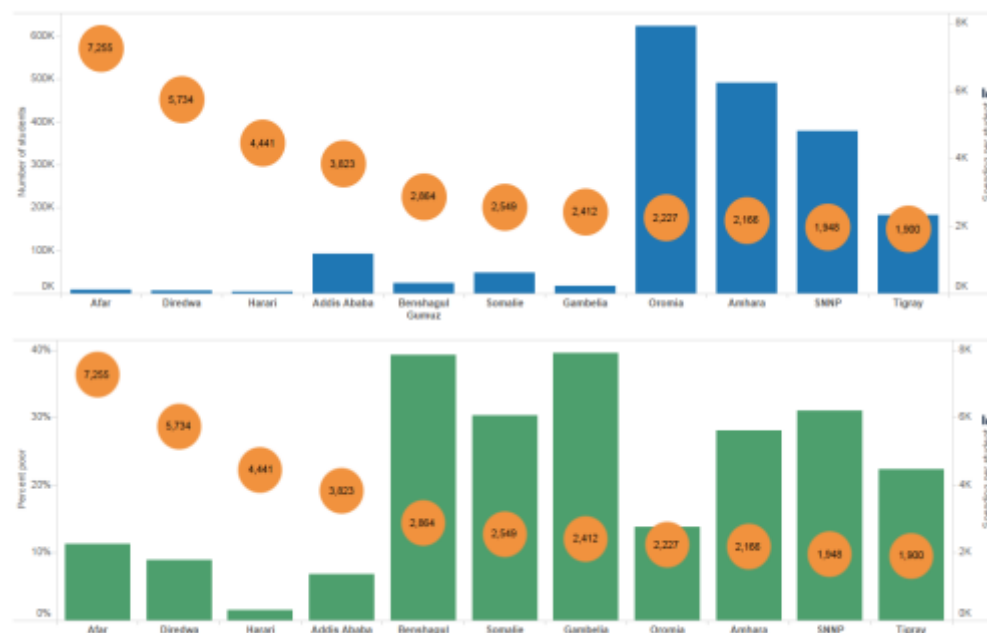


Figure 11 Spending per secondary school student (ETB) versus need in Ethiopia

Source: 2013 Ethiopia Statistical Abstract, 2014 Ethiopia LSMS

with the highest funding per secondary school student, which includes the cities of Addis Ababa and Harari, have also the lowest percent of population in the lowest wealth quintile.

4.2.2.2 Are education resources available for school-aged children distributed equitably across wealth quintiles and subnational regions?

We further examine equity in financing at the subnational level by looking at the differences in public and private resources available to children across wealth quintiles and regions in Ethiopia. We estimate the amount of government resources available per child in each wealth quintile and in each region by calculating attendance rate of primary age children in public schools by wealth quintile and multiplying that by per pupil funding in each district. If attendance in a given quintile is higher, it is assumed that a child from that quintile receives a higher share of the available resources. Because the sample size of the LSMS in Ethiopia is too low to produce such estimates at the secondary level, we focus on primary education.

It can be seen in Figure 12 that on average, children across wealth quintiles benefit similarly from public funding, which means that their attendance rates in public schools are comparable. The biggest exception is Addis Ababa (represented by a blue dot on both charts), where the poorest benefit significantly more especially as compared to the wealthiest quintile which choose private schools over the public sector. In fact, we estimate that the poorest child in Addis Ababa receives eight times more public resources than the wealthiest child (again, with the caveat that we may not have perfect information on to what

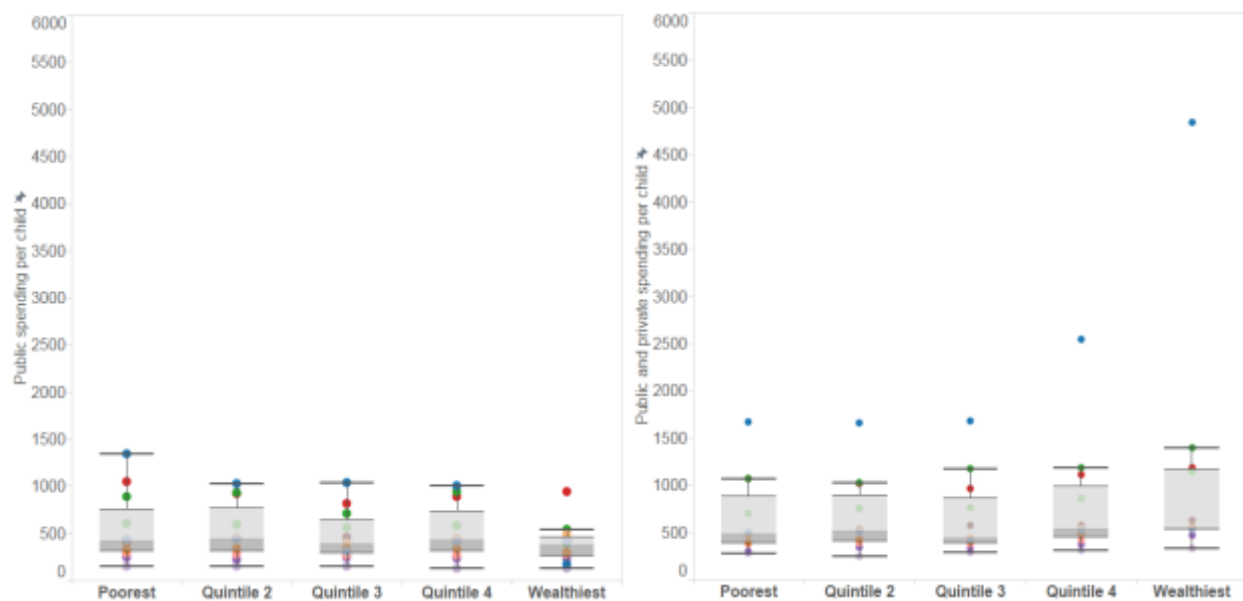


Figure 12 Public and total education resources per primary school age child in Ethiopia

Source: 2013 Ethiopia Statistical Abstract, 2014 Ethiopia LSMS

extent any of the private schools in Ethiopia are subsidized by the government). When we incorporate private spending on education on the right side chart which shows the total education resources available per child in each wealth quintile, we see the reverse is the case: a primary age child in the wealthiest child has 1.6 times more education resources than a primary age child in the poorest quintile.

4.2.2.3 How does the cost of school participation affect attendance decisions among households? Do attendance decisions in relation to potential household spending on education vary by wealth quintile?

Methodological adjustments

Again, for Ethiopia we address the third research question regarding the effect of expected household expenditures when households are facing the decision to enroll their child in school. We quantify the effect of the expected household expenditures on school attendance by estimating equations [9] and [10] under several regression specifications and identification strategies.

It is important to note that the Ethiopia LSMS data do not include questions regarding children's enrollment and grade level status from the previous year. As such, we are not able to identify the effect of expected future cost of attendance on enrollment in the subsequent grade. This is because information on whether a child successfully enrolled in the next grade level is unknown. However, we are able to compute the net attendance rate for each grade level. For instance, in Ethiopia, 8th grade students are theoretically supposed to be 14 years old and 9th graders are supposed to be 15 years old. We are able to calculate the proportion of children who are attending their age appropriate grade level. Low net attendance rates may be more a function of grade repetition and might not be directly related to attendance costs. However, in the transition from primary to secondary school, we argue that the monetary cost of school attendance lowers net attendance further than it would have been under a lower cost of school attendance.

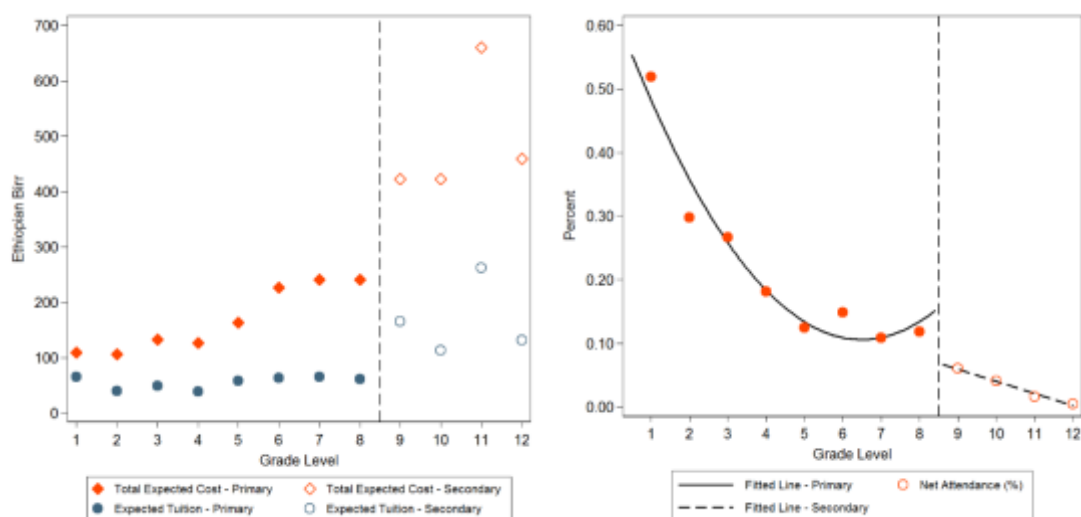


Figure 13 Average cost of education and net attendance rate in Ethiopia, by grade level

Source: 2014 Ethiopia LSMS

Because we want to isolate the effect of expected educational expenditures by grade level, we limit our analytic sample to similar children facing different levels of expected household expenditures on education. Specifically, we limit our sample to two groups of children, those who would be eligible for enrollment in 8th grade and those eligible for enrollment in 9th grade. As a result, we are able to isolate the effect of cost of attendance on net attendance rates by comparing similar students who would differ only in the expected cost of attending their age appropriate grade level. However, it is not unlikely for older children (i.e. eligible for 9th grade) to be expected to contribute to household income rather than attend school, thus making secondary attendance less important.

Figure 13 illustrates our identification strategy using the LSMS data from Ethiopia in 2014. The left hand panel of Figure 13 plots the total expected cost and the expected tuition fee for each primary school grade level as well as for each secondary school grade level, by age. Total expected cost and tuition are both computed as the district average for each grade level across Ethiopia. The figure shows a distinct discrete increase in the expected cost of school attendance both in terms of total costs and in terms of tuition fees as children transition from primary school to secondary school from 241 to 422 Birr. Figure 13 also shows that expected tuition fees for children moving from age 14 years to 15 years increases by about 104 Birr from 61 to 165 Birr.

The second panel of Figure 13 displays the net attendance rate for each grade level as it corresponds to its theoretical grade level in primary and secondary school coupled with a quadratic trend line for primary and secondary school, separately. We can see that a distinct break in the trend in net enrollment rates between 8th and 9th grade. We argue that, although net attendance rates are steadily declining by grade level, net attendance is even lower than it would have been if there were no sharp increase in tuition costs between primary and secondary school.

We exploit within-district variation in the expected cost of attendance between children who theoretically would be attending 8th grade and similar children who would be attending 9th grade to identify the effect of attendance costs on net attendance. This strategy enables us to isolate the effect of cost of attendance from potential confounders that exist between districts such as regional peer (spillover) effects or differences in unobserved characteristics between districts. This strategy will also enable us to provide evidence that the costs associated with school attendance are in fact a significant barrier to school participation.

Findings

Table 7 presents the regression estimation results where the outcome variable is the probability of enrolling in the subsequent grade level and the explanatory variable of interest is the total expected cost of attendance. The first three columns of Table 7 denote estimation of equation [9] under various regression specifications. The first is a naïve regression of the expected total cost of attendance on the likelihood of attending the next grade level. The second runs the same model but with the inclusion of student and household characteristics as control variables. The third column includes district-level fixed effects in addition to the observable control variables.

Lastly, the fourth column estimates equation [10], which stratifies the effect of total expected cost of attendance by wealth quintile to determine whether there are heterogeneous effects across wealth groups. It is important to note that the first two columns identify the effect of attendance costs by comparing progression rates between districts with varying average costs, while the last two columns rely on comparing similar students in the same district who face varying levels of attendance costs. Because there are external factors that render districts incomparable, such as peer effects, cost of living, and affluence, we argue that within district identification of the cost effect is more reliable and closer to the true effect than between-district identification.

Table 7 shows that when relying on between-district variation in expected cost of school attendance to identify the effect of rising schooling costs on net attendance, we find virtually no effect in the naïve model (column 1) and a negative but small effect in the model with control variables (column 2). Specifically, if we only compare net attendance rates between districts with varying levels of expected schooling costs, we estimate that a 100 Birr increase in expected costs is associated with a 0.7 percentage point decrease in net attendance. Relative to the secondary school net attendance rate of 5.1 percent, the effect size translates to a 13.7 percent decrease in likelihood of attending the age appropriate grade level in response to a 100 Birr increase in expected costs.

However, when we rely on within-district differences in expected cost levels that occur as children transition from primary to secondary school, we find that a 100 Birr increase in expected costs lower net attendance rates by 2.4 percentage points, on average. To put the effect size in perspective, the net attendance rate among school age children in our sample is 5.1 percent and the mean difference in expected cost between primary and secondary school is 181 Birr. This means that if the gap in expected costs were to be completely closed, we would expect net attendance rates in secondary school to increase by 85 percent, to 9.9 percent.

Column (4) of Table 7 disaggregates the effect of expected attendance cost on net attendance. We estimate that a 100 Birr increase in total expected cost of attendance lowers net attendance by 3.5 percentage points for the poorest quintile and 2.4 percentage points for the second wealth quintile. This means that a 181 Birr increase in expected costs would lower net attendance by 87 percent and 46 percent for the poorest two quintiles of the population, respectively. On the other hand, we estimate that every 100 Birr increase in expected costs to lower net attendance among the top two quintiles by 3.1 and 1.9 percentage points, respectively. Relative to the actual net attendance rates of each quintile and a 181 Birr increase in expected costs, we calculate that net attendance is lower by 58 percent and 24 percent, respectively. We can see that that the poorest 20 percent of households are more sensitive to changes in the cost of education in terms of their net attendance rates than the more affluent quintiles.

Table 7 Probability of attending age appropriate grade and expected cost of school attendance in Ethiopia

	(1)	(2)	(3)	(4)
Cost to Household:				
Total expected cost of attendance	-0.000 (0.003)	-0.007*** (0.003)	-0.024*** (0.005)	
1st Quintile				-0.035*** (0.006)
2nd Quintile				-0.024*** (0.008)
3rd Quintile				-0.017** (0.007)
4th Quintile				-0.031*** (0.007)
5th Quintile				-0.019*** (0.007)
Wealth Quintile Intercepts:				
2nd Quintile		0.012 (0.020)	0.011 (0.021)	-0.023 (0.035)
3rd Quintile		0.015 (0.019)	0.019 (0.021)	-0.039 (0.035)
4th Quintile		-0.022 (0.019)	-0.016 (0.020)	-0.024 (0.033)
5th Quintile		0.010 (0.021)	0.027 (0.023)	-0.023 (0.037)
Constant	0.106*** (0.011)	0.090*** (0.028)	0.125** (0.055)	0.156*** (0.057)
Control Variables	No	Yes	Yes	Yes
District Fixed Effects	No	No	Yes	Yes
Observations	2,182	2,170	2,170	2,170
R-squared	0.000	0.059	0.120	0.123

Notes: Coefficients are estimated via a linear probability model (LPM). Numbers in parentheses denote robust standard errors. Variables included under "Control Variables" are gender, age, parents' education, household size, religion, and urban location. Analytic sample restricted to students who attended primary grades 7 and 8 last year. Household cost figures are represented in local currency units (hundred Ethiopian Birr). Asterisks denote statistical significance as follows. *** p<0.01, ** p<0.05, and * p<0.10

Next, we replicate the analysis presented in Table 7 but instead of examining total expected costs of attendance, we look at only expected tuition costs. Overall, we find similar patterns to those presented in the previous analysis of overall costs. However, the estimated effect sizes are all smaller in magnitude. Moreover, we still find no effect of expected tuition costs on net attendance when relying on between-district variation in tuition fees (column 1, Table 8). When we include child and household demographic control variables, we observe a decline in net attendance associated with increases in expected tuition by 0.3 percentage points. This translates to a 5.9 percent decrease in net attendance for a 100 Birr increase in expected tuition costs. The estimated effect of tuition costs does not change when including district-level fixed effects, but the estimate is no longer statistically significant at the 10 percent level. However, when we stratify the effect of rising tuition costs on net attendance, we find that the poorest quintile, again, is the group that is most susceptible to changes in tuition costs. In this case, we estimate that a 100 Birr increase in tuition lowers net attendance by 0.9 percentage points. Relative to a net attendance rate of 7.2 percent and a

104 Birr increase in tuition, which is the mean difference in tuition from primary to secondary school, we find that net attendance decreases by 13 percent, from 7.2 percent to 6.3 percent. Conversely, if the gap in tuition costs were to be eliminated, then we would expect net attendance to increase from 7.2 percent to 8.1 percent.

Table 8 Probability of attending age appropriate grade and expected cost of tuition in Ethiopia

	(1)	(2)	(3)	(4)
Cost to Household:				
Expected tuition costs	0.001 (0.001)	-0.003* (0.001)	-0.003 (0.002)	
1st Quintile				-0.009** (0.004)
2nd Quintile				-0.005 (0.005)
3rd Quintile				0.001 (0.004)
4th Quintile				-0.006** (0.003)
5th Quintile				-0.002 (0.003)
Wealth Quintile Intercepts:				
2nd Quintile	0.009 (0.020)	0.010 (0.021)	0.007 (0.022)	0.009 (0.020)
3rd Quintile	0.014 (0.019)	0.018 (0.021)	0.007 (0.022)	0.014 (0.019)
4th Quintile	-0.022 (0.019)	-0.019 (0.020)	-0.019 (0.021)	-0.022 (0.019)
5th Quintile	0.010 (0.021)	0.025 (0.023)	0.018 (0.024)	0.010 (0.021)
Constant	0.103*** (0.007)	0.072*** (0.026)	0.080 (0.054)	0.084 (0.054)
Control Variables	No	Yes	Yes	Yes
District Fixed Effects	No	No	Yes	Yes
Observations	2,182	2,170	2,170	2,170
R-squared	0.00	0.06	0.11	0.11

Notes: Coefficients are estimated via a linear probability model (LPM). Numbers in parentheses denote robust standard errors. Variables included under "Control Variables" are gender, age, parents' education, household size, religion, and urban location. Analytic sample restricted to students who attended primary grades 7 and 8 last year. Household cost figures are represented in local currency units (hundred Ethiopian Birr). Asterisks denote statistical significance as follows. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

4.3 Uganda

- The cost of attending public secondary school is about 10 times higher than the cost of attending public primary schools, and private education costs 5 and 1.3 times more than public education at primary and secondary levels, respectively.
- Given the free and compulsory education laws from primary school in Uganda, tuition and fees at government primary schools should be zero. In practice, however, school fees are still the highest portion of overall spending per child attending primary education, even for families with children attending public schools. School supplies and “other costs” constitute the second and the third largest categories of expenditures.
- An analysis of expenditure data by region shows some equity in resource distribution. Government scholarships in the Central region, which is the most urban and the wealthiest with less than 23% of families in the poorest quintile, are well below the national averages (22%). In contrast, the poorest region (Western) has the largest percentage of children on government scholarships (58.47%). However, the poorest are still spending disproportionately more on tuition and fees relative to their income. The poorest quintile has only 1.5% of the wealth of the top quintile but their spending is about 4.5% of what the wealthiest quintile spends.
- Although the four large regions receive relatively similar government financial support, across districts there is greater variance in both government spending and the allocation of government scholarships, pointing to a number of particularly under resourced areas.
- **Lowering out-of-pocket household expenditures on education approximately double current net attendance, rates from 5.5 percent to 11.1 percent.**
- **We find that the poorest quintiles are most affected by reducing the cost of attendance. However, we note that the effect sizes are also a function of net attendance rates at secondary for the poorest quintile in Uganda, which are near zero.**
- **Lastly, we predict that completely reducing tuition fees would increase overall net attendance rates by 33 percent.**

4.3.1 Context

Uganda was one of the first Eastern African countries to adopt policies supporting free and compulsory primary education. In 1997, the Universal Primary Education (UPE) policy was passed with the key objective to make education accessible to learners and meet their needs and make access equitable by eliminating disparities and inequalities (Duclos et al., 2013). The UPE policy came about in part from the international consensus on the importance of primary education following the creation of the Millennium Development Goals (Ssewamala

et al., 2011) and in part from an internal review process that led to provisions in the 1995 Constitution which enshrined education as a fundamental human right (Duclos et al., 2013).

The Ugandan education system has a six-year primary school cycle that is, in principle, compulsory, followed by four years of lower secondary and three years of upper secondary school. In 2007, Uganda continued its leadership in expanding education by establishing the Universal Secondary Education (USE) policy. The USE policy was the first policy in Sub-Saharan Africa to offer free secondary education (Ashanka & Takashi, 2011). Aimed at increasing access to secondary education for the poor, one school in every sub-county was identified as a USE school and students that passed the Primary School Leaving Exam could attend that school without having to pay for tuition (Molyneaux, 2011). All non-USE government and private schools, however, were able to charge for tuition without a cap on costs. Additionally, families were still responsible for paying for their children's boarding fees, transportation, uniforms, and supplies. Currently, according to LSMS data, about 70% of primary and 49% of secondary school enrollment is in public schools.

The immediate success of the UPE policy was apparent in the sharp increase in primary school attendees and primary school enrollment rates (National Planning Authority, 2015; Ssewamala et al., 2011). The number of children enrolled in primary school jumped from 2.8 million in 1996 to nearly 8.5 million in 2014 (National Planning Authority, 2015). Directly following the implementation of UPE the gross enrollment rate for primary school jumped from under 70% to over 120% (Ssewamala et al., 2011). Additional financial support was harnessed to help with the massive influx of students. From 1995 to 2000 the total public education expenditure as a percent of GDP increased from 2.1% to 4.8% (Duclos et al., 2013) and between 1990 and 1999 the percent of the national budget allocated to education increased from 10.4% to 26% (Ssewamala et al., 2011).

Over the past ten years, however, government financial support for education in Uganda has steadily decreased. From its peak at 26% the percent of the national budget allocated to education has decreased to 18% in 2013 (Arinaitwe et al., 2015) and the share of GDP spent on education dropped to 3.3% in 2013, well below their peer nations and the UNESCO benchmark of 6% (Ministry of Finance, Planning and Economic Development, 2013). The stagnant or declining spending, combined with the increasing relative share of teacher salaries, and the increasing number of students, has led to overcrowding as infrastructure development has not been able to keep up with demand. This has led to overcrowded classrooms with some questioning whether the early progress of UPE is starting to fall apart. Critics specifically suggest that the lack of the government to maintain its promise of free primary education may be pricing poorer families out of the opportunity for an education (Mwesigwa, 2015).

4.3.2 Results

4.3.2.1 *What are the patterns in public and household spending on education at the subnational level within Uganda?*

Household spending

Using Uganda LSMS, we examine household expenditures on both primary and secondary education. Unlike in the Malawi and Ethiopia case studies, for Uganda we do not present estimates of education spending as a percentage of total household expenditure. The spending module in the Uganda LSMS focuses on consumption and is not comprehensive enough to give us reliable estimates of total household spending and the relative share of education costs.

However, based on detailed questions on education expenditures included in the LSMS education module we are able to estimate the costs that households bear related to school attendance. Table 9 shows that at the national level, households spend about 57,000 Ugandan Shilling (UGX) per child attending a public primary school and about 5 times as much per child attending a private primary school. Large regional disparities can be observed with the cost of attending public schools in the Central region being about 3 times higher than in the Eastern region. Across wealth quintiles, spending on both public and private education increases incrementally from poorest to wealthiest quintile. The private school share of primary school enrollment also increases sharply in the wealthier quintiles. While 52% of primary students in the wealthiest quintile attend private primary school, only 12.8% of those in the poorest quintile do so, indicating that public schools remain the primary provider for poor families.

Interestingly, the difference between spending on secondary school attendance in the public and private sector is not as large as it is for primary education, with private school costing 1.3 times as much as public school. Similarly, regional differences are not as pronounced. Wide disparities, however, can be observed across wealth quintiles, with the wealthiest spending about 11 times more per public school attending child as compared to the poorest.

*Table 9 Annual household spending per school attending child in Uganda, by gender, wealth, region, urban/rural, wealth quintile (UGX)**

		Primary				Secondary			
		Public	N	Private	N	Public	N	Private	N
National		57,310	3,401	261,589	1,334	587,294	499	745,022	502
Gender	Male	62,301	1,740	301,796	667	560,009	284	682,139	268
	Female	51,882	1,661	220,612	667	617,930	215	818,447	234
Region	Central	101,900	570	292,762	615	601,467	132	736,786	216
	Eastern	37,168	1,005	187,268	326	452,841	143	563,005	108
	Northern	56,387	1,126	479,949	110	725,667	116	912,429	70
	Western	63,883	700	270,826	283	654,441	108	795,414	108
Area	Rural	51,737	2,936	203,941	973	562,830	340	671,935	294
	Urban	93,487	465	441,446	361	661,736	159	871,833	208
Wealth Quintile	Poorest	25,076	771	55,567	108	92,617	35	55,834	9
	Quintile 2	31,327	857	81,740	176	197,842	63	169,576	43
	Quintile 3	45,936	777	135,646	244	373,915	92	336,131	60

Quintile 4	77,974	622	222,012	394	406,471	129	660,757	116
Wealthiest	176,783	374	583,002	412	1,058,693	180	1,095,750	274

Source: 2011 Uganda LSMS

* In 2011, one Ugandan Shilling was equivalent to 0.0004 USD

Figure 14 breaks down the expenditures on public and private primary education by type. Given the free and compulsory education laws from primary school in Uganda, tuition and fees at government primary schools should be zero. In practice, however, school fees are still the highest portion of overall spending per child attending primary education, even for families with children attending public schools. School supplies and “other costs” constitute the second and the third largest categories of expenditures.



Figure 14 Annual household spending per school attending child in Uganda, by type of expenditure

Source: 2011 Uganda LSMS

Government spending

Subnational data for Uganda included in this case study comes from two sources: briefing papers from the Uganda Ministry of Finance, Planning, and Economic Development and the 2011 Education Statistical Abstract, prepared by the Uganda Ministry of Education and Sports. Two subnational levels are used throughout the analysis. Uganda is divided into four large regions – Eastern, Northern, Western, and Central. For more nuanced local analysis information from the district level is used.

As per capita expenditure was not available at the district level, a proxy for local government spending was calculated from the distribution of teachers. In 2011, teacher salaries made up 63.77% of the overall national education budget in Uganda, or 746.2 billion UGH (Ministry of Finance, Planning and Economic Development, 2013). To approximate the spending per primary age child in each region the following calculations were completed.

(Number of government teachers in each district/total number of government teachers) * monetary value of 2011 national budget for teacher salaries = Spending per district

[i]

Per district spending/total population of primary school age children per district = Spending per child [ii]

As the spending per child proxy is based on the 63.77% of spending allocated to teacher salaries, the proxy is adjusted up in an attempt to approximate 100% of the spending per child in each district.

(Per child spending * 100)/63.77 = Adjusted spending per child [iii]

The adjusted measure provides an annual account approximating government spending per child. In the primary school age population in Uganda the mean annual government spending per child for 2011 was 158.20 UGH. Importantly, this number is based on primary school age child, representing the amount of money allocated for each school age child regardless of whether or not they are attending school. Using the school age population instead of the school going population will draw attention to districts that have a large number of out of school children or low net enrollment rates. For example this measure will provide much different information for districts like Adjumani and Moyo which have large out of school populations and net primary school enrollment rates of 30.0% and 27.3% respectively, compared to their regional peer Lamwo which has a net enrollment rate of 103.7% (Ministry of Education and Sports, 2011).

In addition to the administrative records on government expenditures on education, we include a measure of government scholarships received or available within the district, using information from the LSMS. As the survey data demonstrates, approximately 57% of primary school attendees receive a scholarship from the government. About 3% of children attending private primary schools report receiving a government scholarship. In contrast, over 4 in 5 children attending a government primary school report receiving a government scholarship. The large number of government school students on scholarship may speak to the inadequate amount of general government spending per child.

Table 10 explores differences in government support across broad regions. Based on the table, it would appear that Uganda is moving towards a more equitable distribution of resources and that these resources, to some extent, may be successful in promoting school attendance. The Central region is the most urban and the wealthiest with less than 23% of families in the poorest quintile. Government scholarships in this region are well below the national averages. In contrast, the poorest region (Western) has the largest percentage of children on government scholarships (58.47%) and the second highest amount of government spending (165.44 UGX).

Table 10 Government spending per primary school age child versus need in Uganda

	Percent in poorest quintile (Q1)	Percent considered rural	Percent attending school	Percent receiving government scholarship	Mean government spending per child
Total	26.27	81.51	86.05	46.23	155.47

Central	22.87	71.99	87.14	22.83	142.46
Eastern	27.99	87.94	88.93	54.99	169.14
Northern	27.15	85.41	78.49	57.84	162.23
Western	28.83	83.62	93.27	58.47	165.44

Source: 2011 Uganda LSMS, 2011 Uganda EMIS

4.3.2.2 Are education resources available for school-aged children distributed equitably across wealth quintiles within subnational regions?

This section further examines disparities across wealth quintiles and districts, by looking at the distribution of three types of education resources: government spending, government scholarships, and household expenditures.

With the wealthiest quintile set as the reference group, Figure 15 shows how much education resources each wealth quintile has in comparison with the top quintile. The first bar indicates that families in the first or poorest quintile have approximately 1.5% of the wealth of families in the richest quintile. Although it increases across quintiles, the second highest quintile (Q4) still has less than 25% of the wealth in the top quintile. The disparity in family spending on tuition and fees between the poorest and wealthiest quintile mirrors the pattern of wealth. However, the slightly higher bars for quintiles 2 through 4 indicates that they are spending disproportionately more on tuition and fees, relative to the wealthiest quintile. This is most drastic with the poorest quintile who only account for 1.5% of the wealth of the top quintile but account for nearly 4.5% of spending on tuition and fees as the wealthiest quintile. Equitable policies in supply side resources would be illustrated by having a greater portion of the government spending and scholarships used on the poorest. Although this is the case, the actual benefits of this policy may be minimal. For example, while more is spent by governments in districts where the poorest quintile live, the 4% difference only equates to 6 UGX per child per year. Additionally, while 47% of children in the poorest quintile receive a government scholarship relative to 33% of children in the wealthiest quintile, nearly the same percent of children in the second highest quintile receive a government scholarship (46%) although they have approximately 15 times the wealth of the poorest.

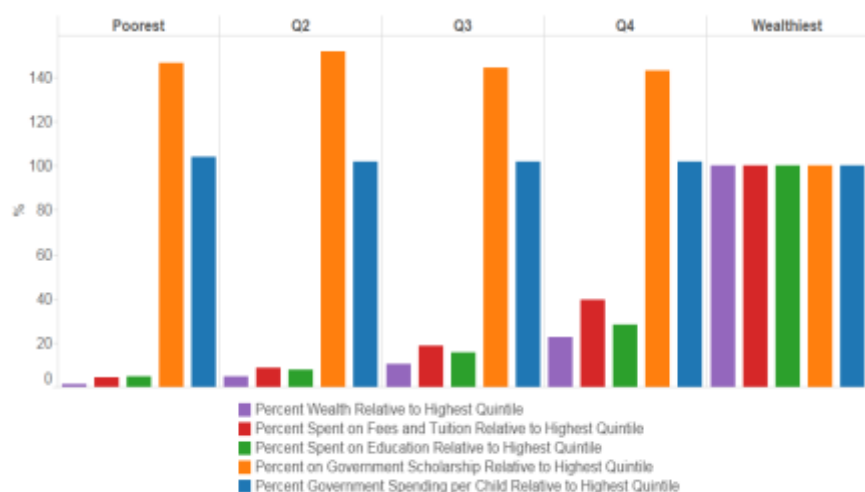


Figure 15 Education resources by wealth quintile in Uganda

Source: 2011 Uganda LSMS, 2011 Uganda EMIS

We now turn our attention to differences within and across districts. Although the four regions receive relatively similar government financial support (see Table 10), Figure 16 illustrates that across districts there is greater variance in both government spending and the allocation of government scholarships. Government spending per child ranges from a low of 16.99 UGH per year in Ntoroko to a high of

282.83 in Nakeseke. Percent of government scholarship are provided to no student in the Buvuma sample but over 98% of primary school attendees in Bududa.

The districts in red on Figure 16 represent those most under-resourced by the government. These districts have less than 22% of students on government scholarships and government spending is less than 92 UGX per child per year. They include Amudat, Buvuma, Kampala,

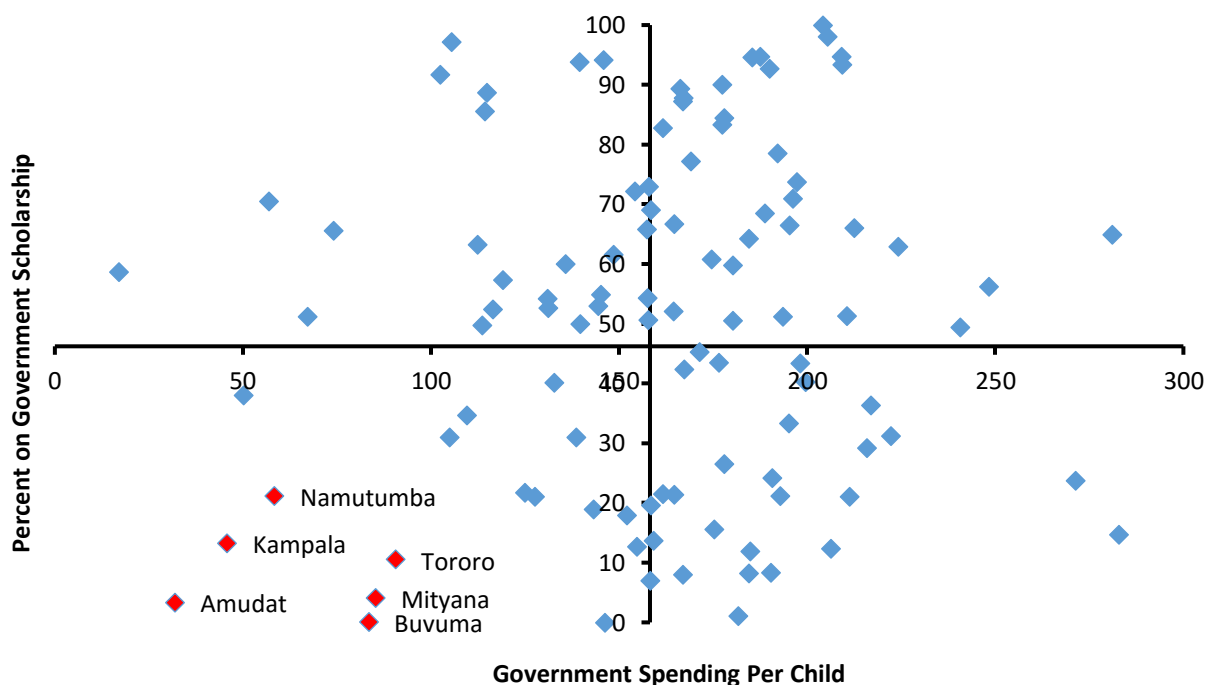


Figure 16 Government spending and scholarships across districts in Uganda

Source: 2011 Uganda LSMS, 2011 Uganda EMIS

Mityana, Namutumba, and Tororo. The district in the far bottom left in the figure, and therefore most disadvantaged, is Amudat. We can see in Table 11 that the poor government

investment in education in this rural district may be associated with poor attendance and intake rates, as well as high pupil-teacher and pupil-classroom ratios that may severely effect education quality.

Table 11 Government support and key characteristics for Amudat district

	Government Spending per Child (UGH)	Percent on Government Scholarship	Percent of Primary School Age Children Attendin g School	Percent in the Poorest Quintile	Net Enrollment Rate ^A	Net Intake Rate to Grade 1 ^A	Primary Pupil- Teacher Ratio ^A	Primary Pupil- Classroom Ratio ^A
Amudat	32.01	3.3%	3.3%	44.0%	24.3%	10.6%	70	83
National Average	158.2	46.2%	86.1%	26.3%	97.5%	63.9%	48	57

Notes: Sample size for Amudat = 90. ^A = taken from Education Statistical Abstract 2011 (Ministry of Education and Sports).

4.3.2.3 How does the cost of school participation affect attendance decisions among households? Do attendance decisions in relation to potential household spending on education vary by wealth quintile?

Methodological adjustments

In this section of the analysis, we address the third research question regarding the effect of expected household education costs on school enrollment decisions. We quantify the effect of the expected household expenditures on school attendance by estimating equations [9] and [10] under several regression specifications and identification strategies. We note two main issues with the LSMS household survey data administered in Uganda that impact the analysis. First, unlike Malawi and LSMS data collected in other countries not all children aged 5 or older were asked whether they had attended school in the previous school year and in which grade. Only students who are currently attending school were asked this question. This means that we are unable to identify all students who were enrolled in school in the previous year but were not enrolled in the current year, and what grade level they attended. As a result, we are unable to measure accurately grade progression rates for each grade level. However, we are still able to calculate net attendance for each grade level, where a child is considered in the net attendance computation if he/she is attending an age appropriate grade level.

Because we observe a clear discontinuity in the expected cost of attendance between the end of primary and the start of secondary school, we limit our regression analytic sample to those children who otherwise would be attending 7th grade and 8th grade. This strategy enables us to identify the effect of an increase in expected cost of attendance on the likelihood of attendance. Figure 17 illustrates our identification strategy using the LSMS data from Uganda in 2011. The left hand panel of Figure 17 plots the total expected cost and the expected tuition fee for each primary school grade level as well as for each secondary school

grade level, by age. We note that we observe two discontinuities in the data in terms of cost of attendance, the first being during the primary to lower secondary transition and the second being during the lower to upper secondary transition.

We see that the expected total cost of attending 7th grade is about 96,000 Shillings, which increases to almost 494,000 Shillings in 8th grade. Similarly, we see the same pattern in terms of tuition costs, where the expected tuition fee for 7th grade enrollment in Uganda is approximately 43,000 Shillings compared to 215,000 Shillings in 8th grade. Interestingly, we observe another discontinuity of this type between 11th grade (4th Secondary) and 12th grade (5th Secondary). Overall expected costs and tuition fees almost double from lower to upper secondary from 530,000 Shillings to 1,048,000 Shillings and from 341,000 Shillings to 624,000 Shillings, respectively. At the same time, we observe a discrete decline in net attendance rates at the same school cost discontinuities as can be seen in the second panel of Figure 17. We observe a drop in the net attendance rate from 7th grade to 8th grade by more than half from 7.5 percent to 3.4 percent.

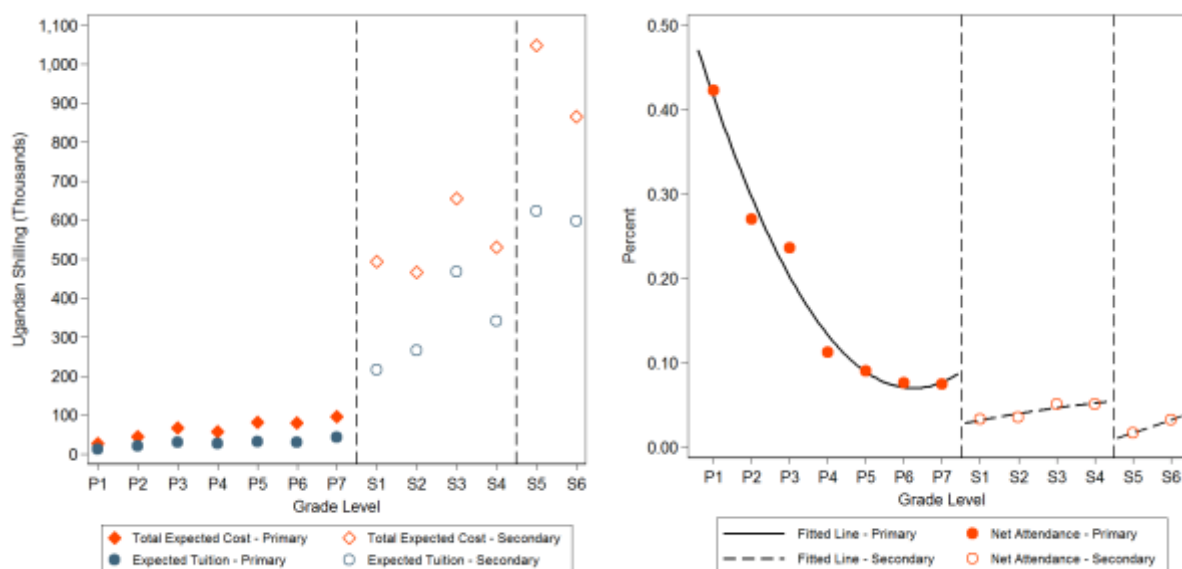


Figure 17 Average cost of education and net attendance rate in Uganda, by grade level

Source: 2011 Uganda LSMS

We follow the same empirical strategy as those implemented in Ethiopia and Malawi where we exploit within-district variation in the expected cost of attendance between children who theoretically would be attending 7th grade and similar children who would be attending 8th grade to identify the effect of attendance costs on net attendance. Note that we do not examine the discontinuity between lower and upper secondary as children who would be attending these grade levels are also deciding their labor force participation in addition to school participation. Our regression analyses and results focus only on the subpopulation who would be eligible for 7th and 8th grade enrollment in Uganda.

Findings

Table 12 presents the regression estimation results where the outcome variable is the probability of attending an age appropriate grade level (net attendance) and the explanatory variable of interest is the total expected cost of attendance of that grade level. The first three columns of Table 12 denote estimation of equation [9] under various regression specifications. The first is a naïve regression of the expected total cost of attendance on the likelihood of attending the next grade level. The second runs the same model but with the inclusion of student and household characteristics as control variables. The third column includes district-level fixed effects in addition to the observable control variables.

Lastly, the fourth column estimates equation [10] interacts the effect of total expected cost of attendance by wealth quintile to determine whether there are differential impacts across wealth groups. We emphasize that the first two columns identify the effect of attendance costs by comparing progression rates between districts with varying levels of average attendance costs. The last two columns rely on comparing similar students in the same district who face varying levels of attendance costs due to the variation in costs between grades only. We argue that within-district results are less biased than using the full sample without district fixed effects because we are able to account for the district-level effect that may influence attendance decisions as well as the cost of attendance.

Table 12 shows that when relying on between-district variation in expected cost of school attendance to identify the effect of rising schooling costs on net attendance, we find somewhat modest negative effects that are statistically insignificant in both the naïve model (column 1) and the model with control variables (column 2). Specifically, we estimate that a 100,000 Shilling increase in expected costs is associated with a 0.6 percentage point decrease in net attendance. Relative to the secondary school net attendance rate of 3.4 percent, the effect size translates to a 17.6 percent decrease in the likelihood of attending an age appropriate grade level. However, when we rely on within-district differences in expected cost levels that occur as children transition from primary to secondary school, we find that a 100,000 Shilling increase in expected total costs lower net attendance rates by 1.4 percentage point. This effect translates to approximately a 42 percent increase in the net attendance rate. If the existing gap in cost of attendance between grades 7 and 8 were to be eliminated, which is a 398,000 Shilling decrease in costs, we would expect to see a 5.6 percentage point increase in net attendance. This translates to a 102 percent increase in net attendance rates from 5.5 percent to 11.1 percent.

Lastly, Column (4) stratifies the effect of the expected cost of attendance on the likelihood of attending an age appropriate grade level. We find that households are price sensitive in terms of schooling among almost all wealth groups, except for the second quintile. We estimate that a 100,000 Shilling increase in the expected total cost of schooling leads to a 1-percentage point decrease in the likelihood of attending an age appropriate grade level in the poorest quintile, which is an increase from 0.2 percent to 1.2 percent. Further, we find that the probability of attending an age appropriate grade level in response to a similar 100,000 Shilling increase in expected costs leads to a 1.1 percentage point decrease in net attendance rates for households in the third quintile from 2.3 percent. Similarly, we estimate

a 3.1 percentage point decrease in the net attendance rate in the fourth quintile from 8.3 percent. Lastly, we estimate a 1.1 percentage point decrease in the net attendance rate of children in the wealthiest quintile from a net attendance rate of 14.8 percent. It is clear that the magnitude of the effect of changes in the expected cost of attendance, relative to the net attendance rate for each quintile, increases with poorer subgroups.

Table 12 Probability of attending age appropriate grade and expected cost of school attendance in Uganda

	(1)	(2)	(3)	(4)
Cost to Household:				
Total expected cost of attendance	-0.004 (0.006)	-0.006 (0.005)	-0.014** (0.006)	
1st Quintile				-0.010** (0.004)
2nd Quintile				0.003 (0.009)
3rd Quintile				-0.011** (0.005)
4th Quintile				-0.031** (0.014)
5th Quintile				-0.011 (0.015)
Wealth Quintile Intercepts:				
2nd Quintile		0.008 (0.018)	0.003 (0.017)	-0.023 (0.025)
3rd Quintile		-0.002 (0.018)	-0.012 (0.018)	-0.006 (0.024)
4th Quintile		0.027 (0.025)	0.008 (0.027)	0.073 (0.061)
5th Quintile		0.092** (0.041)	0.059 (0.037)	0.061 (0.064)
Constant	0.068** (0.027)	-0.054 (0.038)	0.040 (0.051)	0.043 (0.048)
Control Variables	No	Yes	Yes	Yes
District Fixed Effects	No	No	Yes	Yes
Observations	1,061	1,061	1,023	1,023
R-squared	0.002	0.083	0.168	0.174

Notes: Coefficients are estimated via a linear probability model (LPM). Numbers in parentheses denote robust standard errors. Variables included under "Control Variables" are gender, age, parents' education, household size, religion, and urban location. Analytic sample restricted to students who attended primary grades 7 and 8 last year. Household cost figures are represented in local currency units (hundred thousand Ugandan Shilling). Asterisks denote statistical significance as follows. *** p<0.01, ** p<0.05, and * p<0.10

Next, we replicate the analysis presented in Table 12 to investigate the impacts of changes in expected tuition costs on net attendance, nationally and by wealth quintile. The results in Table 13, below, mirror those found in the previous analysis examining the effects of total expected costs on attendance. However, the regression results show a general loss in precision for all the estimated parameters of interest as none of the coefficients are statistically significant. However, we still estimate that a 100,000 Shilling increase in tuition lowers net attendance rates by 1.8 percentage points, which translates to almost a 33 percent decrease in net attendance.

When examining the impacts of changes in expected tuition among the different wealth quintiles, we find again that all wealth quintiles except for the second quintile exhibit a high level of price sensitivity. Moreover, children in the poorest quintile are 0.3 percentage points more likely to attend as expected tuition costs decrease by 100,000 Shillings, equivalent to a 150 percent increase in net attendance. Net attendance in the third quintile would be expected to increase by 1.2 percentage points from 2.3 percent, in the fourth quintile net attendance would increase by 6.7 percentage points from 8.3 percent. Lastly, among the wealthiest quintile, net attendance would increase by 3.5 percentage points from 14.8 percent for a 100,000 Shilling decrease in tuition. We find that the poorest quintile exhibits the highest tuition semi-elasticity relative to the other wealth quintiles.

Table 13 Probability of attending age appropriate grade and expected cost of tuition in Uganda

	(1)	(2)	(3)	(4)
Cost to Household:				
Expected tuition costs	-0.016 (0.011)	-0.017 (0.011)	-0.018 (0.012)	
1st Quintile				-0.003 (0.006)
2nd Quintile				0.013 (0.018)
3rd Quintile				-0.012 (0.009)
4th Quintile				-0.067 (0.049)
5th Quintile				-0.035 (0.023)
Wealth Quintile Intercepts:				
2nd Quintile		0.011 (0.017)	0.007 (0.018)	-0.013 (0.025)
3rd Quintile		-0.003 (0.019)	-0.009 (0.019)	0.004 (0.023)
4th Quintile		0.021 (0.023)	0.007 (0.027)	0.085 (0.077)
5th Quintile		0.085** (0.043)	0.059 (0.036)	0.105** (0.051)
Constant	0.103*** (0.007)	0.072*** (0.026)	0.080 (0.054)	0.084 (0.054)
Control Variables	No	Yes	Yes	Yes
District Fixed Effects	No	No	Yes	Yes
Observations	1,061	1,061	1,023	1,023
R-squared	0.006	0.086	0.098	0.115

Notes: Coefficients are estimated via a linear probability model (LPM). Numbers in parentheses denote robust standard errors. Variables included under "Control Variables" are gender, age, parents' education, household size, religion, and urban location. Analytic sample restricted to students who attended primary grades 7 and 8 last year. Household cost figures are represented in local currency units (hundred thousand Ugandan Shilling). Asterisks denote statistical significance as follows. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

5 Conclusions and policy implications

Our analysis has attempted to disentangle the relationship between public and household contributions to education finance, using three cases of Sub-Saharan African countries with recent history of school fee abolition in primary grades. Table 14 summarizes the conclusions we have reached by research question across the three cases. Across the board, we found that cost of attendance is a significant factor in family decision making related to school enrollment, and that existing levels of public resources are insufficient to bridge the gap between the poorest and the relatively wealthy. Government spending on education is by and large benefitting wealthier students to a larger extent, thereby likely deepening rather than reducing existing inequalities. The vast disparity in the absolute levels of household spending on education between the wealthy and the poor may serve as a proxy of the quality of the learning experience.

Table 14 Main findings in all three country case studies: Malawi, Ethiopia, and Uganda

	Malawi	Ethiopia	Uganda
Research Question 1 What are the patterns in public and household spending on education at the subnational level within the case countries?	<p>The cost of attending public secondary school is about 16 times higher than the cost of attending public primary schools, and private education costs 10 and 3 times more than public education at primary and secondary levels, respectively.</p> <p>Some districts receive twice as much funding per student as others. No clear patterns between poverty levels and per pupil spending can be identified across districts at either primary or secondary level.</p>	<p>The cost of attending public secondary school is about 4 times higher than the cost of attending public primary schools, and private education costs 15 and 11 times more than public education at primary and secondary levels, respectively.</p> <p>Some regions receive 11 times more resources per student than others, and cities receiving more funding per student than rural areas.</p>	<p>The cost of attending public secondary school is about 10 times higher than the cost of attending public primary schools, and private education costs 5 and 1.3 times more than public education at primary and secondary levels, respectively.</p> <p>The four large regions receive relatively similar government financial support, across districts there is greater variance in both government spending and the allocation of government scholarships, pointing to a number of particularly under-resourced areas.</p>
Research Question 2 Are education resources available for school-aged children distributed equitably across wealth quintiles	<p>An average primary school age child in the wealthiest quintile has 1.5 times more education resources than a child of the same age in the poorest quintile, while at the secondary level, the wealthy child has about 5 times more education resources.</p>	<p>A primary age child in the wealthiest quintile has 1.6 times more education resources than a primary age child in the poorest quintile.</p>	<p>A child in the poorest quintile spends disproportionately more on tuition and fees relative to their income. An analysis of expenditure data across regions, however, shows some equity in resource distribution.</p>

and subnational regions?			
Research Question 3 How does the cost of school participation affect attendance decisions among households? Do attendance decisions in relation to potential household spending on education vary by wealth quintile?	<p>Eliminating all out-of-pocket expenses on education from households would increase the likelihood of school attendance by about 26 percent.</p> <p>Eliminating household expenses on education entirely among the poorest two quintiles would increase the likelihood of school attendance by 43 and 54 percent, respectively.</p>	<p>Eliminating out-of-pocket household expenditures on education would increase attendance by 85 percent, from 5.4 percent to 9.9 percent.</p> <p>Eliminating tuition fees alone would only increase net attendance by about 6 percent.</p> <p>The poorest quintiles would benefit relatively more from a reduction in the cost of attendance.</p>	<p>Eliminating out-of-pocket household expenditures on education would double current net attendance rate at the secondary level from 5.5 percent to 11.1 percent.</p> <p>Eliminating tuition fees only would increase overall net attendance rates by 33 percent.</p> <p>The poorest quintiles would most benefit from a reduction of the cost of attendance.</p>

Policy Implications. This study demonstrates once again the importance of public financing in education. While critics may argue that increasing spending in education does not always improve outcomes for the poor, our empirical analysis shows that eliminating expenditure on education can have dramatic effects on school participation and retention, thereby allowing children from lower income households to break cycles of poverty. The absolute level of spending on education matters, and public finance for education must account for the full spectrum of school-related expenses faced by families. Scholarships for tuition and subsidies for out-of-pocket expenses would have substantial equalizing effects on households at the lower end of the wealth distribution. We are aware that this implies an increase in the total amount of funding necessary for education – and we believe it is important to correct the inequities in learning environments for children from different social classes.

Finally, the difficulty in carrying out our analysis with existing data highlighted the continuing scarcity of data on education finance. Greater precision in the understanding of the distribution of resources, including teacher deployment, infrastructure support, and school supplies, at the school level coupled with data on the population served by each school would go a long way in helping policy makers shape resource allocation decisions with explicit concern for equity in mind. This study uses one dimension of equity – wealth – to examine resource distribution patterns. Further insight can be gained by examining what resources are available for children characterized by other types of disadvantage, such as language minority status, migration status, or disability. As our results show, education finance mechanisms, and by extension aid programming in education, can strengthen the transformative role of education – but they must be rooted in empirical data that capture the full extent of existing inequities.

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Annex

6.1 Theoretical household spending and school attendance model

We posit a simple theoretical framework to model a household/family unit/child's decision to participate, or attend, school as a function of expected future earnings, schooling, and cost of attending school. Moreover, suppose that each decision-making unit maximizes household utility by maximizing lifetime earning under two states of the world. The first would be a state in which the household unit decides to send the child to school and the second is a state where the child does not attend school, presumably to engage in income generating activity. Using this simple model, we present the household decision making mechanism to participate or not participate in school. The theoretical model also serves as a basis for our empirical exercise to estimate the effect of school attendance in relation to facing varying levels of educational costs as well as varying levels of government spending on education.

Let $U(y, s)$ denote the household utility function that increases with income y , and income is a function of schooling s . The decision maker, therefore, maximizes household utility subject to a budget constraint that takes into account future income from attending school in the current period, future income from not attending school in the current period, and the cost of attending school in the current period. Formally, we present our theoretical framework as follows:

$$\max_{y,s} U(y, s) \quad [1]$$

$$s.t. \quad B = s \cdot f(y) + (1 - s) \cdot g(y) - s \cdot C \quad [2]$$

$f(y)$ and $g(y)$ represent the individual earnings function as a result of attending school in the current time period and not attending school in the same period, respectively. The individual then chooses whether to attend school—where s is an indicator that takes on a value of 1 if the individual chooses to attend, 0 otherwise—to maximize the household utility subject to the budget constraint B , as described in equation [2]. Kuhn-Tucker conditions that satisfy the budget constraint are

$$\frac{\partial U}{\partial y} = s \cdot \frac{\partial f(y)}{\partial y} + (1 - s) \cdot \frac{\partial g(y)}{\partial y} = 0 \quad [3]$$

$$\frac{\partial U}{\partial s} = f(y) - g(y) - C = 0 \quad [4]$$

Thus, the school attendance decision that maximizes household utility can be solved using equations [3] and [4]. After some algebra, the optimal solution for s is represented as:

$$s^* = a \cdot [f(y) - g(y) - T] \quad [5]$$

where,
$$a = 1 / \left(\frac{\partial f(y)}{\partial y} + \frac{\partial g(y)}{\partial y} \right) = \text{constant} \quad [6]$$

$\frac{\partial f(y)}{\partial y}$ and $\frac{\partial g(y)}{\partial y}$ are nothing but the returns to schooling from the two earnings functions.

Further, we see from the solution presented in equation [5] that the optimal solution to school attendance, at the household level, depends on whether the expected earnings from attending school including the cost of attendance outweigh the expected earnings from entering the labor market immediately. Empirically, the age-earnings profile of individuals in Malawi, Ethiopia and Uganda with a lower level of schooling yield lower net lifetime earnings as compared with individuals with more schooling. Figures 18, 19 and 20 below, plots the age-earnings profiles for Kenya, Malawi, and Uganda, by level of educational attainment.

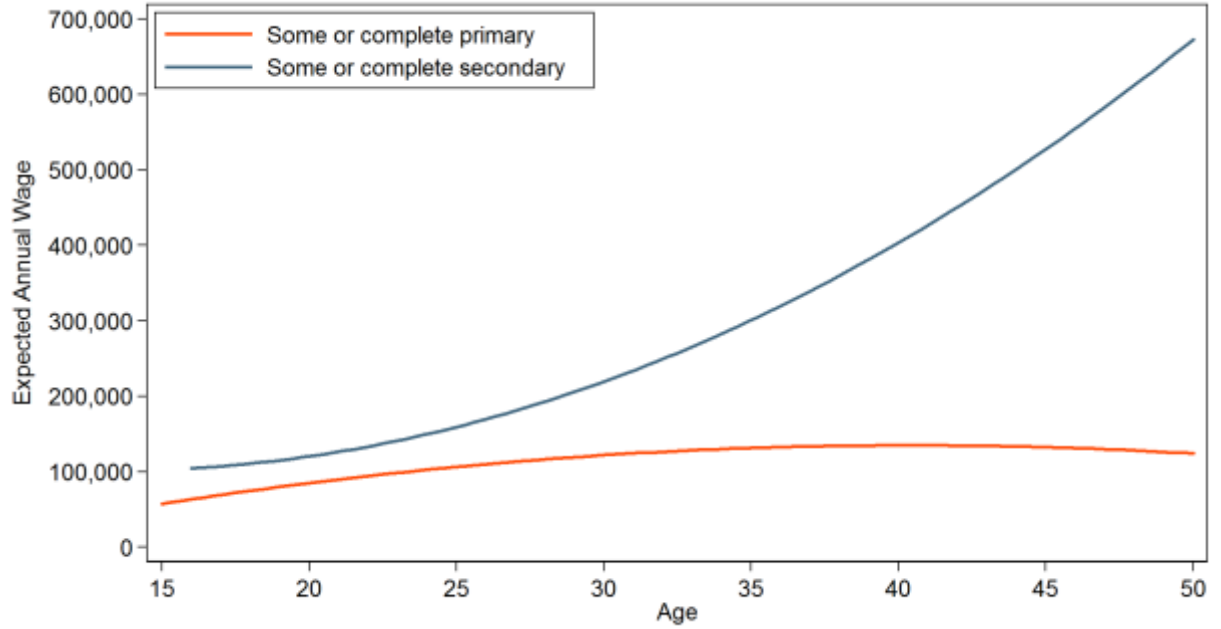


Figure 18 Age Earnings Profile for Malawi

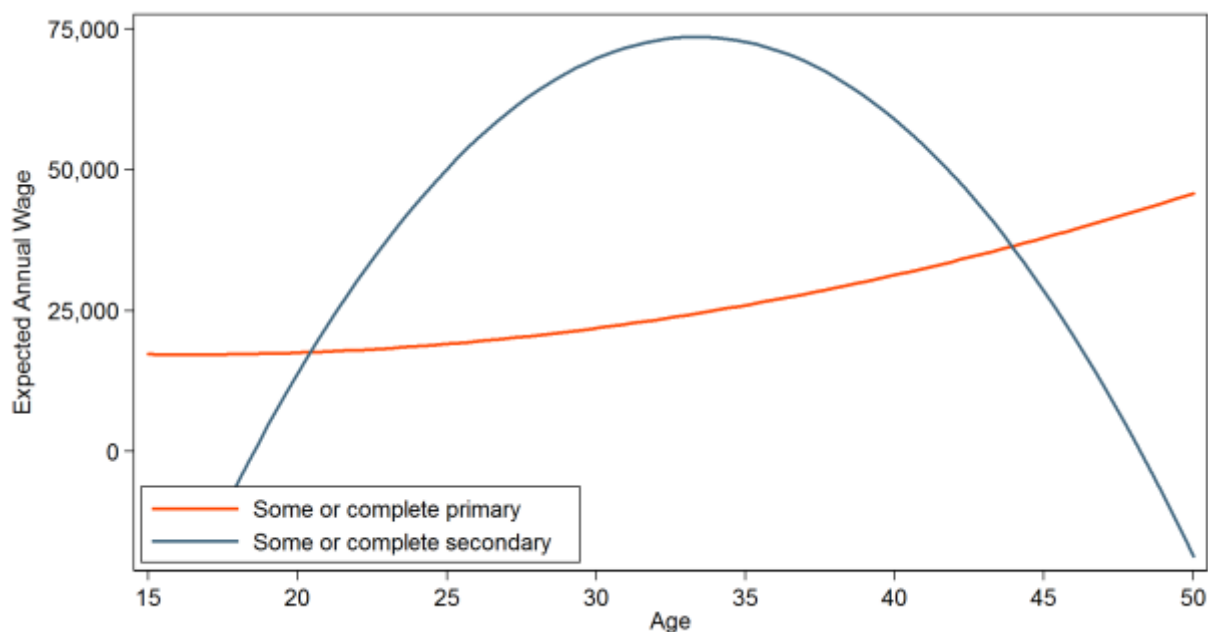


Figure 19 Age Earnings Profile for Ethiopia

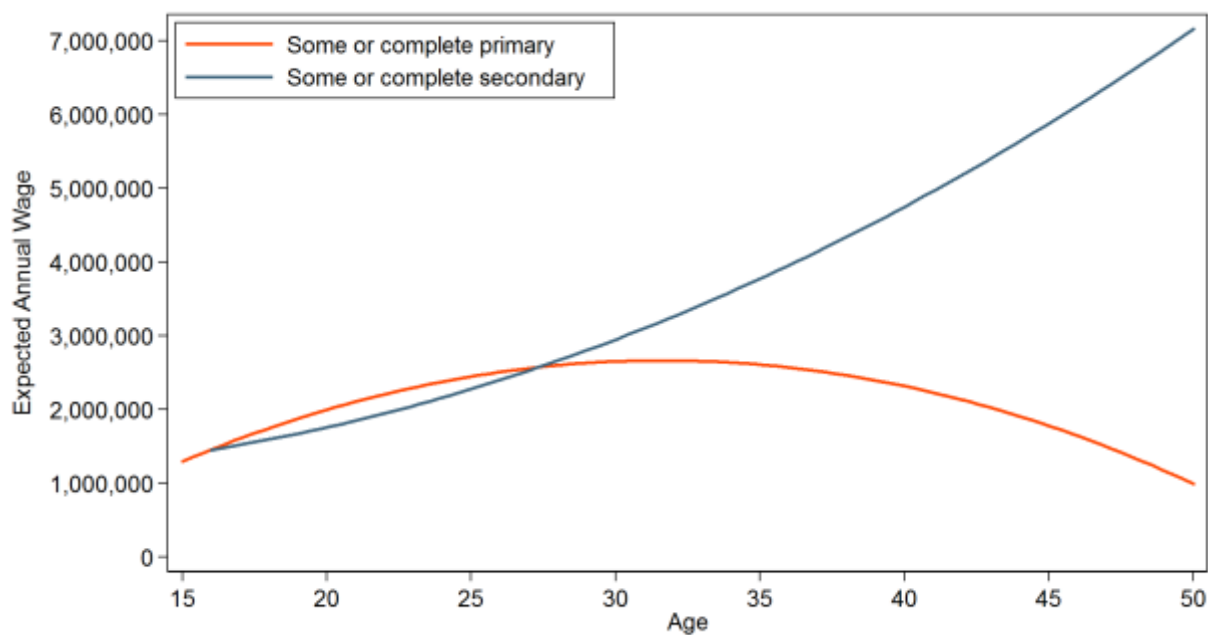


Figure 20 Age Earnings Profile for Uganda

In all countries, we see that the lifetime earnings from attending more schooling yields are higher. However, it is unclear whether varying levels of costs associated with school participation would lower the net benefits from attending more schooling and, thus, deter

individuals from attending school. More formally, the optimal solution to school attendance can be represented as:

$$s^* = \begin{cases} 1, & \text{if } f(y) - g(y) - C > 0 \\ 0, & \text{if } f(y) - g(y) - C \leq 0 \end{cases} \quad [7]$$

Finally, we perform simple comparative statics on the solution for s^* in equation [5] to determine the theoretical relationship between school participation and the cost of school attendance.

$$\frac{\partial s^*}{\partial C} = -1 / \left(\frac{\partial f(y)}{\partial y} + \frac{\partial g(y)}{\partial y} \right) < 0 \quad [8]$$

In this case, our theoretical model implies that a negative relationship between the cost of education and the likelihood of school attendance. Note that we are assuming that the returns to schooling is exogenous to the individual, i.e. beyond their control since these are determined by the labor market.

6.2 Empirical Specification

Formally, we estimate the following probability model to identify the effect of expected changes in cost on the conditional likelihood of school participation:

$$\Pr(Y_{it} = 1 | \bar{C}_g, X_{it}, \mu_g) = \alpha \bar{C}_g + X_{it} \delta + \theta_g + \varepsilon_{it} \quad [9]$$

$\Pr(Y_{it} = 1 | \bar{C}_g, X_{it}, \mu_g)$ is the probability that a child i , interviewed in period t , and resides in geographic region/district g attends school in the following year. \bar{C}_g is the expected cost of attending school in geographic region g at each grade level—it is the same cost faced by all residents of the same region. X_{it} denotes a matrix of observable demographic characteristics for each student including age, gender, parents' education, religion, and home language.⁹ θ_g represents the subnational region/district level fixed effect, which ensures that α is identified using within region/district variation in educational expenditures to assess the impact on attendance. Lastly, ε_{it} is the idiosyncratic error term.

Given our identification strategy, we restrict the analytic sample to only those children who are currently attending 7th and 8th grade who will be facing the decision to attend school in the following year.¹⁰ Moreover, current 7th graders will be facing a lower expected cost of

⁹ The demographic control variables may differ slightly for each country in this study.

¹⁰ For Uganda, we will restrict the analytic sample to those children currently attending 6th and 7th grade as primary school ends in 7th grade, whereas 8th grade is considered lower secondary school.

schooling than current 8th graders as a result of universal primary education, whereas 8th graders who are potentially transitioning to secondary school will now face a stricter budget constraint with the introduction of tuition fees into the expected cost of school attendance. However, the samples of current 7th and 8th graders are balanced along their observable characteristics, as represented in X_{it} to ensure that the RD design is able to viably isolate the effect of cost of school attendance on school attendance (Imbens and Lemieux, 2008; Lee and Lemieux, 2010).¹¹ We note that it is likely that our estimate of α is not causal, however, we are able to estimate unambiguous effects with less potential for bias.

Lastly, we stratify our analysis by wealth quintile to determine whether tuition effects are heterogeneous across different portions of the wealth distribution. We note that it is likely that the analytic samples will be too small for stratification. To address the small sample sizes we will interact the cost effect with indicators for each wealth quintile to maintain the original sample size rather than run the same regression five separate times. Therefore, equation [9] becomes:

$$\Pr(Y_{it} = 1 | \bar{C}_g, X, I_w, \mu_g) = \sum_{w=1}^5 \alpha_w \cdot I_w \cdot \bar{C}_g + X_{it}\delta + \theta_w + \theta_g + \varepsilon_{it} \quad [10]$$

where I_w represents an indicator variable that takes on a value of 1 if child i is identified in wealth quintile w , zero otherwise. As such, the interaction term $I_w \cdot \bar{C}_g$ yields five separate estimates of the effect of cost of school participation on the likelihood of attendance for each of the five wealth quintiles. The inclusion of θ_w , which denotes wealth quintile fixed effects, ensures that the effect of the cost of schooling is identified by comparing similar children in different grade levels within the same wealth quintile.

¹¹ We may rely on propensity score matching to ensure sample balance if the 7th and 8th grade samples are unbalanced along the different elements of X_{it} .

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