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Determinants of Educational Achievement and Attainment In Africa

Household Schooling Decisions in Tanzania

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Abstract

The study utilizes household survey data from 1993/94 to estimate the rate of return to schooling and the indirect as well as the direct costs of schooling. Rates of return at both primary and secondary levels are found to be low by regional standards and costs as a fraction of incomes for the lowest fifth of the population, while affordable for primary school, are very high for secondary school. Indirect, or opportunity, costs are much larger than direct, out-of-pocket, costs. Tanzania's uniquely low secondary enrollment rates can be explained by these factors as much as by supply constraints. Building more secondary schools may not significantly change the situation. Adjusting fees and subsidies would help, but in the end there has to be an improvement in the labor market for educated workers.

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Executive Summary

Primary school gross enrollment rates were 82 percent in Tanzania in 1993, roughly 10 percentage points lower than those reported in 1980. Although the official starting age for primary school is 7 years old, the average starting age was over 9. Moreover, Tanzania's secondary enrollment rates remain among the lowest in the world; gross enrollment rates were just below 10 percent in 1993, while net enrollment rates were about 7 percent.

What are the key factors driving these outcomes, and what kinds of interventions can improve education sector performance in Tanzania? This paper seeks to provide some answers to these questions. To do so, the paper uses household survey data from Tanzania to analyze the private returns and costs of primary and secondary schooling, including the opportunity cost of children's time. The paper also analyzes the determinants of school enrollment and late starting to clarify how policy might improve schooling outcomes.

Analysis of hourly earnings in the formal wage sector indicates that private returns to education were 7.9 percent at the primary level and 8.8 percent at the secondary level in 1990/91. Comparison with other recent studies suggests that these returns are relatively low by regional standards, and that they may have declined during the 1980s. Care must be taken in interpreting these findings, however. Although the majority of Tanzanians work in informal sectors, including non-wage agriculture, there is no direct evidence on returns to education in these sectors. In addition, recent policy reforms and the resulting economic changes in Tanzania may well be changing the level and structure of returns to education in the economy. Just how strong incentives are to invest in education -- particularly at the secondary level -- remain unclear.

At the same time, evidence on the costs of primary and secondary schooling is instructive. Household survey data from 1993/94 indicate that the full private costs of schooling are much lower at the primary level than at the secondary level. The per student direct costs of primary schooling, including fees and contributions, uniforms, school supplies, and transportation, comprise no more than 6 percent of total per capita expenditure, even among very poor households. And while the opportunity cost of children's time is two-and-a-half to 3 times larger than the direct costs at the primary level, the full costs still represent a relatively small proportion of per capita income. In contrast, the per student direct costs of secondary schooling makes up about 80 percent of per capita expenditure among the poorest households. Moreover, the opportunity cost of children's time is approximately two-and-a-half times higher at the secondary than at the primary level. The direct and indirect costs together are 4 to 5 times higher for secondary education than for primary education.

These dramatic cost differences between the primary and secondary levels suggest several possible explanations for the observed patterns of enrollments at the primary and secondary levels. Enrollment rates suggest that primary schooling remains a relatively

attractive and affordable investment for most households. At the secondary level, however, higher costs make schooling far less affordable. In fact, in the absence of borrowing opportunities, many households may be unable to finance secondary education. In addition, although available data do not permit a direct comparison of the benefits and costs of secondary education, the significantly higher costs may affect households' perception regarding to profitability of investing in secondary schooling.

A number of interrelated factors affect the benefits and costs of education, thereby influencing households' effective demand for schooling. Constraints in households' ability to finance education or in the supply of school spaces also affect enrollment and late starting decisions. To isolate the effects of the key factors on household schooling decisions, this paper estimates the determinants of primary and secondary enrollment and late starting econometrically, based on the 1993/94 household survey. At the primary level, neither the direct costs of primary education nor household income significantly affect enrollment or late starting. At the same time, the analysis indicates that the opportunity cost of children's time is a significant determinant of primary enrollment and late starting. The opportunity cost of girls' time is a particularly important determinant of whether children enroll in school and start on time. Constraints in the supply of primary schools are also significant determinants of household enrollment and late starting decisions.

At the secondary level, the opportunity cost of girls' time also has a significant impact on girls' enrollment. In contrast to the primary level, however, household income and distances to schools do play significant roles in household enrollment decisions at the secondary level. This finding on household income is consistent with the school cost analysis, which suggests that households have limited ability to finance education at the secondary level. The fact that distances to schools are a significant determinant of secondary enrollment implies that the monetary and time costs associated with travel to schools (and perhaps boarding) significantly affect secondary enrollment decisions.

Simulation analysis suggests that modest improvements in secondary enrollment rates could be achieved through policies or programs that compensate households for the direct and indirect costs of schooling and that reduce distances to schools. Nevertheless, several key issues remain. The first issue is how important constraints in the supply of classroom spaces are in determining secondary school enrollments. No direct data on per capita school spaces were available at the secondary level for Tanzania. However, school supply constraints are significant at the primary level (holding distances to schools constant). Given that until recently, the supply of secondary education was severely limited as a matter of policy, supply constraints almost certainly remain central to the enrollment picture at the secondary level.

The second issue concerns education quality. School quality affects returns to education and, hence, household schooling decisions. The key questions are: What factors are important? And, what impact do they make? Insufficient data were available to capture school quality, at either the primary level or secondary levels. However, such

data are critical to evaluating just how large an impact quality improvements would make on primary and secondary school participation.

The final issue concerns the role of private returns to secondary education in determining secondary school participation. A deeper understanding of economy-wide returns to schooling is clearly needed. For example, if expected returns to educated labor are low in most sectors of the economy, then education sector interventions alone -- whether they address household demand for schooling or the supply of education -- will be insufficient to induce widespread private investment in secondary schooling. While programs that reduce households' costs will have some impact, ongoing commitment to economic policies that foster broad-based growth and increase demand for educated labor will be essential to increasing participation in secondary education.

1. Introduction

Performance of the education sector in Tanzania has raised serious concerns about how to improve education outcomes there. Primary school gross enrollment rates were 82 percent in 1993, roughly 10 percentage points lower than those reported in 1980. Late starting is the norm; although the official starting age for primary school is 7 years, the average starting age is over 9 years old. Official illiteracy have risen from 10 percent in 1986 to 16 percent in 1992; and data from a recent household survey indicate that self-reported illiteracy rates may be twice official estimates (World Bank, 1995a). At the secondary level, enrollment rates are among the lowest in the world. In 1993, gross enrollment rates were just below 10 percent; net enrollment rates were about 7 percent.[1]

Moreover, nationwide averages often conceal important differences in schooling outcomes across rural and urban areas, across poor and non-poor households, and across boys and girls. Particularly at the secondary level, enrollment and retention levels are lower in rural areas than in urban areas and among the poor than the non-poor. Also in rural areas, secondary school enrollment and retention levels are considerably lower for girls than for boys.

In Tanzania, as elsewhere, whether or not children go to school is affected by complex interactions between the supply of education and households' demand for schooling. Both supply and demand of education are affected by a number of factors, including government policies on education sector investment and access to education, the direct and indirect costs of schooling, school quality, the local economic environment, and the expected returns to education.

This paper focuses on households and the factors that influence household schooling decisions. Parents' decisions to school their children are determined by their assessment of the relative (discounted) costs and benefits of schooling. In general, as long as the incremental benefits of schooling outweigh the incremental costs, parents will desire to send their children to school. The benefits of schooling can be measured in terms of the increased earnings capacity of children, while the costs are measured both in terms of the direct costs of schooling -- school fees, contributions, textbooks, uniforms, transportation and boarding, if necessary -- and the indirect costs -- the value of children's time in alternative activities. However, even if households expect the benefits of (additional) schooling outweigh the costs, families may well be constrained in their ability to send their children to school. For example, poor households in Tanzania may be constrained in their ability to finance education, especially at the secondary level. Moreover, even when households are prepared to send their children to school, constraints in the number of school spaces available may limit their ability to do so.

[1] Calculated from the Tanzania Human Resource Development Survey (HRDS), 1993.

The main objective of this paper is to better understand the factors that influence household schooling decisions and how policy can improve education outcomes at the primary and secondary levels in Tanzania. To achieve this objective, the paper pursues two lines of analysis. First, the paper quantifies the benefits and costs associated with primary and secondary schooling in Tanzania, including the opportunity cost of children's time. Second, the paper analyzes the key determinants of household primary and secondary school enrollment and late starting decisions. Special emphasis is placed on the gender dimensions of primary and secondary schooling outcomes.

The paper is organized as follows. To help place the analysis in context, Section 2 summarizes some of the key features of the primary and secondary schooling systems in Tanzania and highlights the patterns of enrollment and late starting that the paper attempts to explain. Section 3 presents new estimates of private returns to education using data from Tanzania's 1990/91 Labor Force Survey (LFS). Section 3 also reviews evidence from other countries in the region and for Tanzania over time to help place current returns in perspective. The private costs of primary and secondary education are then investigated in Section 4. Using data from the 1993/94 Human Resource Development Survey (HRDS), the section first presents profiles of the direct costs of primary and secondary schooling. Opportunity costs are also widely recognized as critical components of the costs households incur in schooling their children; however, very few studies have quantified the value of children's time in alternative activities. Using new data on children's time use, both from the HRDS and the 1994 Focused Area Study Technique (FAST) surveys, estimates of the opportunity cost of children's time are constructed. Section 4 concludes by presenting profiles of the "full" private costs of primary and secondary education in Tanzania. To isolate the effects of key factors influencing household schooling decisions, the determinants of primary and secondary school enrollment and late starting are estimated econometrically, using HRDS and LFS data. These results are presented in Section 5. Section 6 then presents the results of policy simulations that examine how secondary school enrollments would change in response to changes in key policy variables. The paper concludes by summarizing the main findings and highlighting their implications both for policy and for future research.

2. School Enrollment and Late Starting

Primary education in Tanzania is a 7-year cycle, considered by law to be compulsory. All children are expected, officially, to enter school at age 7. The Government of Tanzania has sought to make primary education universally available and affordable to all households. Efforts to achieve universal primary education have included campaign-style programs to ensure the availability of primary schools and teachers in every viable village, as well as attempts to orient the structure and curriculum of primary education to rural life. To make primary education affordable, the Government of Tanzania subsidizes nearly all the costs of schooling at the

primary level. Virtually all education at the primary level is provided through government schools (World Bank, 1995a).

Secondary education in Tanzania is comprised of 4 years of lower secondary and 2 years of upper secondary schooling. Unlike at the primary level, secondary education is not (even nominally) compulsory, nor have efforts been undertaken to make it widely accessible. In fact, traditionally, the Government has rationed the number of secondary school spaces based on projected needs in the formal sector, especially in the civil service. Admission to secondary school has been determined largely by students' performance on national examinations. In this context, however, the Government has worked to promote equity of admissions through a quota system that gives preferential treatment to certain "disadvantaged" groups, including girls. As in the case of primary education, the private sector's role in the delivery of secondary education has been extremely limited, at least until recently. In 1984, policy changes opened up new possibilities for the private sector to operate secondary schools. This has helped to increase opportunities for secondary education considerably in Tanzania. Between 1984 and 1992, for example, the number of private schools tripled, as did private school enrollments. While both public and private secondary schools expanded rapidly between 1984 and 1992, constraints in the supply of school spaces still appear to be critical to the secondary school enrollment situation. There are still as many as 5 new primary school graduates for every available school space at the lower secondary level (World Bank, 1995a).

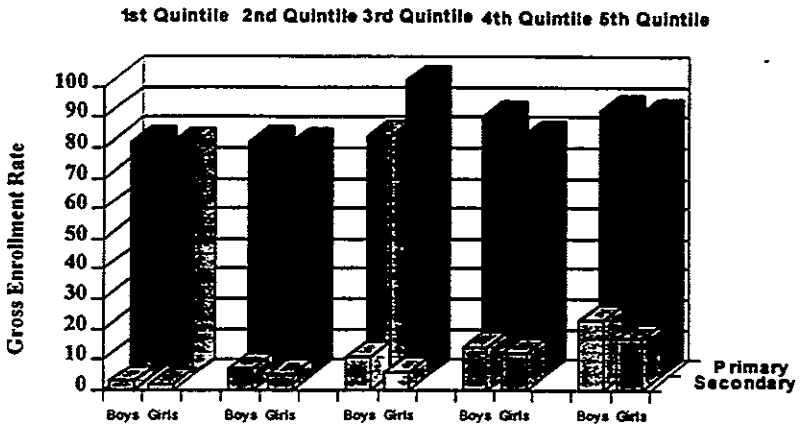
2.1 Enrollment. In spite of apparent declines in primary school gross enrollment rates since 1980, rates are roughly in line with other low incomes countries in sub-Saharan Africa (World Bank, 1995c).[2] Moreover, primary enrollment rates remain extremely high relative to those at the secondary school level (Figure 1). Enrollment rates are also fairly even across the income distribution -- although in general they rise as household per capita expenditure rises. For example, primary school gross enrollment rates are 77 percent among households in the lowest expenditure quintile, about 6 percent lower than average and nearly 12 percent below enrollment rates among the wealthiest quintile. No systematic gender gap is observed in enrollment rates at the primary level. However, a slightly lower percentage of girls than boys actually complete primary school (World Bank, 1995a).

Secondary school enrollment rates are extremely low across the expenditure distribution. In addition, disparities between enrollment rates among those in the poorest quintile and those in the wealthiest quintile are more pronounced than at the primary level. Secondary gross enrollment rates among boys in the lowest quintile are only 27 percent of boys' rates, on average, and just 13 percent of rates among boys in the top quintile; enrollment rates among girls in the

[2] There is some question regarding the extent to which reported declines in primary school enrollment rates reflect actual falls in the proportion of children enrolled as opposed to reporting problems in the data. Between 1974 and 1980, Tanzania carried out a drive to achieve universal primary education (UPE). While primary enrollment rates reported in 1980 may reflect, in part, the accomplishments of the UPE drive, they likely also reflect political or administrative pressures to report certain levels of progress at the primary level.

poorest quintile are just 25 percent of girls' rates, on average, and 12 percent of those among girls in the wealthiest quintile. Also, a gender gap emerges at the secondary level. Even though girls' and boys' enrollment rates are at near parity in the first year of lower secondary school (Form I), by the upper secondary level (Forms V and VI), only 25 percent of students are female (World Bank, 1995a).

Figure 1: Primary and Secondary Gross Enrollment Rates in Tanzania, By Quintile, 1993



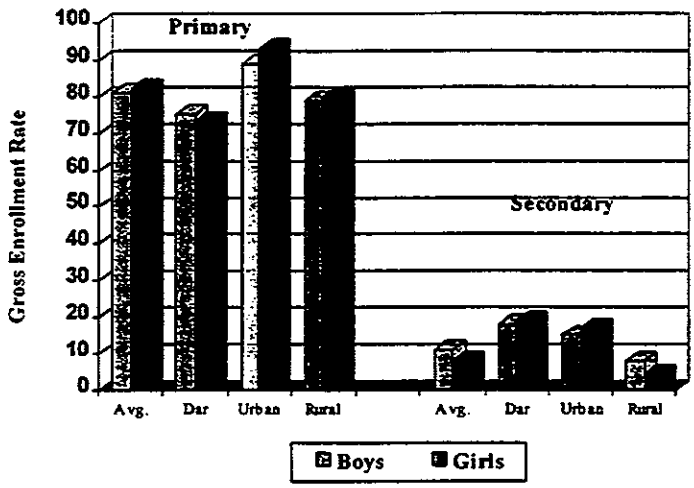
Source: HRDS, 1993

All-Tanzania enrollment rates, however, conceal several aspects of the enrollment picture present in the HRDS data. First, the data suggest that primary enrollment rates in Dar es Salaam are lower than those in other urban or rural areas (Figure 2). This is contrary to expectations given the relatively high income levels and better school infrastructure in the capital.[3] Second, the data indicate that the gender gap at the secondary school level is predominantly a rural phenomenon (Figure 2). The data also suggest that current disparities in secondary school

[3] In light of strong anecdotal evidence that enrollments rates are considerably higher in Dar es Salaam than in other parts of Tanzania, this finding may reflect problems with the HRDS sampling frame in the capital.

enrollment rates are more significant across expenditure quintiles and major geographic regions than across boys and girls (Table 1).

Figure 2: Gross Enrollment Rates, by Gender and Location, 1993



Source: HRDS, 1993

2.2 Late Starting. Late starting is chronic in Tanzania. Both girls and boys start late, but boys tend to start slightly later than girls; the average starting age for girls is 9, whereas the average starting age for boys is nearly 10.[4] Over all, approximately 84 percent of all current primary school enrollees started school late; roughly half of these students started three or more years late (Table 2).

[4] Evidence from the FAST survey suggest possible sources of the gender difference in late starting. Interviews data suggest that parents prefer daughters to start school relatively early so that girls can complete primary school before reaching puberty, thus avoiding risk of pregnancy. Parents expressed a preference for starting their sons later so that the sons were old enough to enter the workforce upon completion of primary school (World Bank, 1995a).

Table 1: Primary and Secondary School Enrollment Rates, by Expenditure Quintile, Gender and Location, 1993^

Gross Enrollment Rates

	Lowest Quintile		Highest Quintile		Average	
	Male	Female	Male	Female	Male	Female
Primary School						
Dar es Salaam	n/a	n/a	74	72	75	73
Other Urban	79	94	88	92	89	93
Rural	77	74	90	87	79	80
All Tanzania	77	76	87	86	81	82
Secondary School						
Dar es Salaam	n/a	n/a	23	21	18	19
Other Urban	1	2	31	28	15	17
Rural	3	2	15	7	8	4
All Tanzania	3	2	23	17	11	8

Net Enrollment Rates

	Lowest Quintile		Highest Quintile		Average	
	Male	Female	Male	Female	Male	Female
Primary School						
Dar es Salaam	n/a	n/a	51	53	50	54
Other Urban	54	60	69	68	62	68
Rural	50	52	66	65	53	56
All Tanzania	50	53	65	65	55	59
Secondary School						
Dar es Salaam	n/a	n/a	18	19	13	17
Other Urban	1	2	22	24	11	14
Rural	2	2	7	5	5	3
All Tanzania	2	2	15	14	7	7

Source: HRDS, 1993.

^ See Appendix Table 1 for data on enrollment rates for all quintiles.

Table 2: Incidence of Late Starting (Among Current Primary School Enrollees)

	Boys	Girls	Total
Percentage of Students Who Enrolled Late	85.3	82.3	83.7
Percentage of Whom Enrolled: ^			
1 Year Late	18.1	22.9	20.6
2 Years Late	26.8	30.9	28.9
3 Years Late	21.8	24.2	23.1
4 Years Late	17.5	12.1	14.7
5 or More Years Late	15.8	9.9	12.7

Source: HRDS, 1993

^ Columns may not add up to 100 due to rounding error.

3. Private Returns to Education

Assuming they face no constraints to financing education or rationing of classroom spaces, households will tend to invest in their children's education so long as the incremental benefits they expect to obtain from the investment exceed the incremental costs.[5] But what sort of returns to schooling can households expect to obtain in Tanzania?

To assess private returns to formal labor market activities, wage functions were run on the 1990/91 LFS data. Equations were run for males and females together, as well as separately, for all Tanzania.[6] A Heckman two-step procedure was used to correct for sample selection bias that could arise from using ordinary least squares to estimate returns to education solely for the individuals who have chosen to participate in the wage labor market.

The estimates are consistent with human capital theory regarding about returns to education. The coefficients on the education variables are all positive and significant at the 5

[5] While the private benefits associated with education may include the utility of education as a "consumption good," the following discussion considers education primarily as an investment good. This is consistent with recent research that suggested low-income households tend to view education largely as an investment good (Mason, 1994).

[6] Equations were also estimated separately for Dar es Salaam, other urban, and rural areas (Appendix Table 3). However, because these regionally disaggregated equations contain small data cells for upper secondary and higher education, the regional estimates should be interpreted with caution.

percent level. The values of the coefficients on the education variables increase, as expected, with higher levels of education. Lambda, the sample selection correction factor derived from the Heckman procedure, is positive and statistically significant at the 5 percent level for the female wage equation. This positive and significant Lambda indicates that women with relatively higher "ability" participate in the labor market and earn higher wages than would women who have chosen to stay at home (Appendix Tables 2 and 3).

The wage equation estimations indicate that average yearly returns to education range from 7.9 percent at the primary level to 8.8 percent at the secondary level (Table 3). The results also indicate that, at roughly 13 percent, private returns to primary and secondary education are considerably higher for females than for males.[7] Returns to education are also slightly higher at the secondary level than at the primary level.

Table 3: Private Returns to Primary and Secondary Education in the Labor Market, by Gender, Tanzania, 1990/91

	Average Yearly Returns, by Level			Marginal Wage Effects, by Level		
	Male	Female	Both	Male	Female	Both
Primary	6.8	12.8	7.9	47.5	89.7	55.0
Secondary	8.1	13.0	8.8	48.7	77.9	52.7

Source: LFS, 1990/91. (Derived from Appendix Table 2.);

Comparisons of these estimates with those from other countries or time periods require caution because methodological and data differences can give rise to differences in estimated returns. Nonetheless, estimates from other sub-Saharan African countries suggest that private returns in Tanzania are relatively low by regional standards. Psacharopoulos (1994) reports estimates of returns to years of schooling for seven sub-Saharan African countries, including for Tanzania using 1980 data. Returns to a year of schooling range from 8.0 percent (in 1972) for Ethiopia to 20.1 percent (in 1986) for Côte d'Ivoire, averaging 13.4 percent. At the same time, available estimates provide mixed evidence regarding changes in returns to education in Tanzania between 1980 and 1990. For example, Psacharopoulos (1994) reports estimates of average returns to education as 11.9 percent per year in 1980. This is considerably higher than

[7] Only at the university level do private returns to education appear to be higher for men than women. However, this result appears to be driven, at least in part, by the lack of observations in rural areas (Appendix Table 2).

the 7.9 to 8.8 percent returns indicated in the 1990/91 LFS data, suggesting that returns have declined over time. At the same time, separate earnings functions estimates (Knight and Sabot, 1990) suggest that earnings premiums to lower secondary graduates increased between 1980 and 1990/91. While it is impossible to draw definitive conclusions from these studies, one possibility is that private returns to secondary education increased slightly between 1980 and 1990/91, whereas returns to primary education declined.

Several other factors complicate the assessment of current returns to primary and secondary education in Tanzania. For example, it is not clear how accurately private returns to education in formal wage employment reflect returns in the economy as a whole, especially in rural areas. While 58 percent of the labor force in Dar es Salaam and 29 percent in other urban areas reported wage employment as their primary occupation in 1990, only about 4 percent of the rural labor force reported wage employment at their primary activity.[8] Conversely, about 93 percent of the rural labor force reported working primarily in *non-wage* agriculture (LFS, 1990/91). Even accounting for rural-to-urban migration, the vast majority of rural residents can expect to end up working in non-wage, agricultural enterprises. Hence, understanding how private returns to education influence schooling decisions in rural areas requires understanding returns to education in agriculture in Tanzania.

Relatively little is known about returns to education in agriculture in Tanzania, however. No data are available in the LFS with which to estimate returns to education in agriculture, and no other direct estimates appear to exist for Tanzania. Extensive work has been done on returns to education in agriculture in other countries, including some recent research on Kenya. In the absence of direct evidence, findings from these studies can help to shed some light on the probable relationship between education and agricultural productivity in Tanzania.

Several recent studies have found significant improvements in agricultural productivity associated with farmer education (Jamison and Lau, 1982; Quisumbing, 1994; Rosenzweig, 1995). The studies also find, however, that returns to education in agriculture tend to be higher in modern and technologically dynamic production systems than in traditional agricultural settings. This appears to be the case because education enhances farmers' abilities to learn and adapt in a dynamic environment, whereas such abilities seem less critical to increasing productivity in traditional agricultural systems (Rosenzweig, 1995). Hence, to the extent that agriculture in Tanzania is based on traditional production methods, private returns to education in agriculture might be expected to be relatively low.

Recent empirical evidence from Kenya (perhaps the closest parallel to Tanzania) on how education affects agricultural productivity paints a mixed picture. An 1976 study of maize farmers in Kenya's Vihiga district found that farmers with four or more years of formal education obtained greater output per unit of inputs than did farmers with no formal education

[8] Less than 2% of rural women report working in the wage sector as their primary activity.

(Moock, 1976). However, more recent studies provide far weaker evidence of positive private returns to education in Kenyan agriculture. For example, an evaluation study of the effects of the "training and visit" (T&V) extension system in Kenya did not find a significant effect of primary education either on aggregate farm production or on aggregate output per input (Bindlish and Evenson, 1993). The study did find, however, that extension (as measured by the ratio of field extension workers to farm households) has a positive effect on output and total factor productivity. In addition, a 1992 study found no significant effect of plot manager's formal education on the value of the plot's yield (Saito et al., 1992). At the same time, education did appear to affect agricultural input use; that is, more educated farmers were more likely to use modern inputs.

Assessing economy-wide returns to education in Tanzania is also complicated by recent changes in the economic environment in Tanzania. Since 1986, Tanzania has undertaken economic reform measures that have had important effects on employment and output in several sectors. These economic changes may have affected returns to education in ways not captured by estimates using the 1990 data. For example, liberalization of food crop marketing and improvements in foreign exchange management have led to significant increases in food and export crop production as well as informal sector employment. In changing the environment, these reforms may have provided the basis for higher returns to education in agriculture and the informal sectors. Retrenchment of government employees in the early 1990s also probably affected returns to formal sector employment -- although the direction of change is ambiguous, a priori. If retrenched workers have not been fully absorbed into to private sector, then wage premiums to post-primary education may have declined, at least temporarily, whereas if private sector growth has increased demand for educated labor, then returns to education may have increased.

4. The Private Costs of Education

Household schooling decisions are not only influenced by the promise of higher earnings in the future, but the costs that households must bear now in sending their children to school. These costs include direct costs -- such as school fees and contributions, uniforms, school supplies, transportation and sometimes boarding -- as well as the indirect costs -- the value of children's time in alternative activities. While extensive work has been done recently quantifying the direct costs of schooling (e.g., World Bank, 1993, 1995a, 1995b), very little work has been done to quantify the opportunity cost of children's time.[9] This section presents quantitative estimates of the direct and opportunity costs of schooling in turn.

[9] Gertler and Glewwe (1989, 1992) estimate, but do not report, the value of children's work foregone when they attend school; Mason (1994) estimates the opportunity cost of children's time for lower secondary school-aged children in rural Java.

4.1 Direct Costs. On average, in 1993, households spent approximately Tsh 320 per month on primary education.[10] Of this amount, households spent roughly half on uniforms, 25 percent on fees and contributions, 20 percent on books and supplies, and remaining 5 percent on miscellaneous costs, including transportation. Total amounts spent per student varied considerably across regions and expenditure quintiles. For example, while the poorest rural households spent under Tsh 167 per month, the wealthiest households in Dar es Salaam spent nearly Tsh 1,720, over ten times as much (Table 4).

Table 4: Average Household Expenditure per Student Enrolled in Primary Schools, 1993, by Location (Tsh per month)

Primary	Lowest Quintile	Top Quintile	Average
Dar es Salaam	555	1,719	831
Other Urban	244	896	455
Rural	166	454	246
All Tanzania	167	682	320

Source: HRDS, 1993

Per student expenditures are significantly higher for secondary schooling. On average, households pay nearly 11 times more per student for secondary than for primary school (Table 5). Moreover, at the secondary level, fees and contributions together with transportation and boarding costs make up the bulk of the direct costs. For example, fees and contributions comprise 36 percent and transportation and boarding comprise 28 percent of direct costs at the secondary level. This compares with 16 percent for uniforms, 13 percent for books and school supplies, and about 7 percent for miscellaneous costs. Figures on average per student expenditures at the secondary level conceal important differences in the costs of private and public education, however. On average, per student expenditure on private secondary schools is about 63 percent higher than on government schools (Table 5). As in the case of primary schools, the per student direct costs of secondary schooling vary considerably across regions and across the expenditure distribution -- although the variation is less pronounced than at the primary level. The variation is muted in part because children do not necessarily attend secondary schools associated with their region of origin. If they are selected (on the basis of a qualifying exam) to attend a government school, the school they attend may bear little relationship to their home region.

[10] This is approximately US $0.70 per month at an exchange rate of roughly Tsh 455 per US dollar in the second half of 1993.

In general, the poor spend less for education per student than do the wealthy, at both the primary and secondary levels (Table 4; Table 5; Figure 3). At the same time, sending one child to school costs poor households more as a proportion of their per capita income than it does wealthy households (Figure 4).[11] This pattern is particularly striking at the secondary level. Sending a child to secondary school costs the average household in the wealthiest quintile 21 percent of their total per capita expenditure, whereas sending a child to school costs the average household in the poorest quintile, 81 percent of their total per capita expenditure. Because the poor pay direct costs for secondary schooling that are so high relative to their income, they may find it difficult to afford unless they are able to borrow from outside sources.[12]

Table 5: Average Household Expenditure per Student Enrolled in Secondary Schools, 1993, Government, Private, and Both, by Location (Tsh per month)

All Schools	Lowest Quintile	Top Quintile	Average
Dar es Salaam	2,227	7,285	4,110
Other Urban	2,202	4,850	3,530
Rural	2,802	3,730	3,359
All Tanzania	2,420	4,474	3,490
Government Schools Only	**Lowest Quintile**	**Top Quintile**	**Average**
Dar es Salaam	1,626	5,928	3,865
Other Urban	2,535	3,308	2,358
Rural	1,544	2,565	2,513
All Tanzania	1,497	3,252	2,547
Private Schools Only	**Lowest Quintile**	**Top Quintile**	**Average**
Dar es Salaam	2,880	8,783	4,492
Other Urban	2,531	5,899	4,345
Rural	3,886	4,390	3,906
All Tanzania	3,350	5,299	4,141

Source: HRDS, 1993

[11] This observation is consistent with patterns found in Indonesia (World Bank, 1993; Mason, 1994) and Vietnam (World Bank, 1995b), countries where similar analyses have been carried out.

[12] A recent World Bank report (1995a) questioned the extent to which the expenditures households pay for education translate into education quality. For example, although direct costs for private secondary schools are higher than for government secondary schools, quality remains higher in government schools. However, to the extent that higher expenditures on education translate into higher quality education for any given type of school, poor children would obtain lower quality education than wealthy children. Under such circumstances, the poor would be paying a higher proportion of their per capita incomes (per student) for lower quality education.

Figure 3: Average Monthly Direct Expenditure Per Student, by Quintile, All Tanzania, 1993

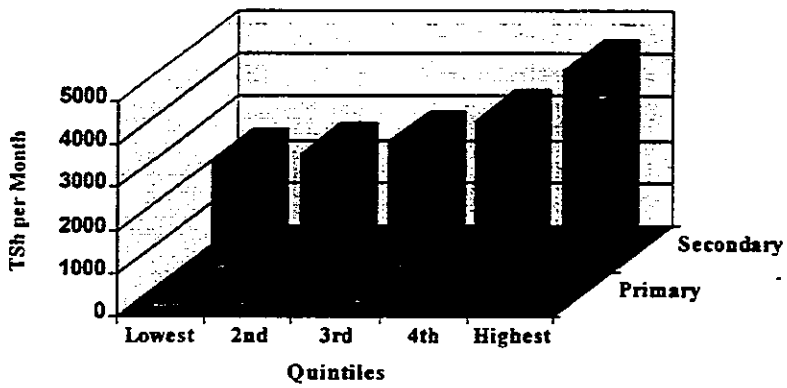
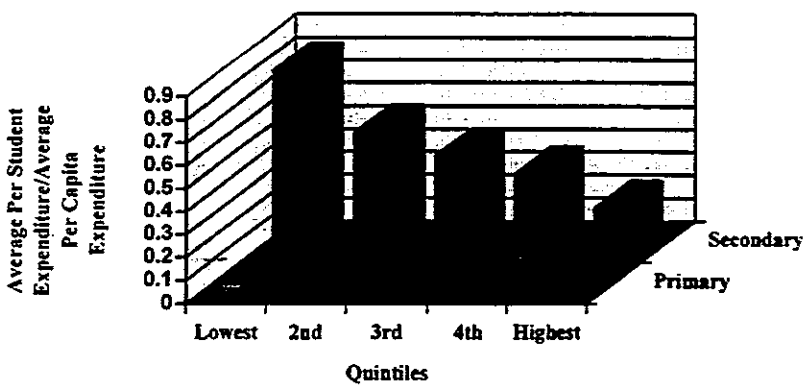
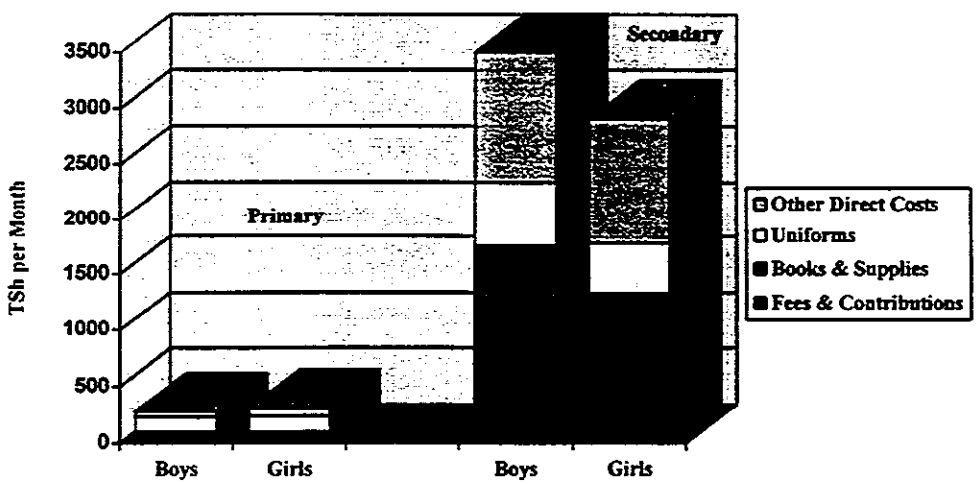


Figure 4: Primary and Secondary School "Affordability" Ratios, by Quintile, All Tanzania, 1993



The direct costs of schooling may well differ by gender. This could result, for example, of higher transportation costs in societies where it is inappropriate for women to walk extended distances or where parents are reluctant to send girls to school without proper attire. Evidence from Morocco, for example, found the direct cost of schooling higher for girls than for boys (e.g., Khandker, Lavy and Filmer, 1994). This appears to be the case at the primary level, but not secondary level in Tanzania (Figure 5). At the primary level, average per student expenditures on girls' schooling is about 14% higher than for boys', although the absolute differences are small. At the secondary level, however, boys' schooling appears to cost parents more than girls'. This results largely from higher fees and uniform costs paid for boys than for girls. Although the HRDS data do not provide sufficient information to understand unambiguously why these differences might arise, there are at least two reasons why this might be the case. First, the HRDS data suggest that the direct costs of upper secondary schooling are higher than those at the lower secondary level. Since female enrollment rates in Forms V and VI are much lower than for boys, this finding may reflect a positive correlation between grade levels and school fees. [13] Second, if boys are systematically sent to better schools than girls and this quality difference is reflected in fee structures, then this could account for the gender differences observed in secondary school direct costs.[14]

Figure 5: Average Primary and Secondary Direct Costs in Tanzania, 1993, by Gender



[13] Because the number of observations available for calculating the direct costs in Forms V and VI is very small, the apparent association between secondary school level and direct costs should be viewed with some caution.
[14] These differences do not, however, seem to arise from the gender distribution of enrollments between private and public or day and boarding schools. The HRDS data indicate that the distribution of students across types of schools is quite similar for girls and boys.

4.2 Opportunity Cost. The opportunity cost of children's time also makes up an important component of the costs households must bear when they send their children to school. The opportunity cost of a child's time represent the value of foregone earnings or household work associated with a child's going to school, including classroom time, homework and travel to and from school. Recent evidence from Indonesia suggests that the opportunity cost of attending lower secondary school can be as much as twice the direct costs of schooling for low-income households in rural Java (Mason, 1994).

Understanding the opportunity cost of children's time first requires some understanding of how children spend their time. Using data from the HRDS time use module and FAST data set, time use profiles were developed for boys and girls in 5 different age cohorts between the ages of 7 and 21. Four categories of information were calculated: 1) average hours worked per week in labor force *plus* household work[15] by children not attending school; 2) average hours worked per week in labor force *plus* household work by children attending school; 3) average hours spent in school *plus* on school work by children attending school; and 4) average hours of work foregone by children attending school. This final category was calculated as the difference between the average hours worked by children not attending school and those attending school. Averages were calculated for all Tanzania, since small sample sizes in the time use modules made interpreting regionally disaggregated data difficult.

While the HRDS and FAST data provide somewhat different estimates of the exact hours worked or in school, the trends they show are quite similar (Table 6). Not surprisingly, as children get older, those who attend school tend to spend more time in school and on school work; those who do not attend school spend more time working. This trend does not differ by gender of the child. Children who attend school also carry out labor force and household work. In fact, although there is no clear increasing trend in hours worked by school children until they reach 19 to 21 years of age, it is clear that children attending school spend more time on productive activities (and implicitly less time on leisure) than do children not attending school. In general, children spend surprisingly long hours in productive activities of one sort or another. For secondary school aged children in particular, total hours engaged in productive activities may well rival those of adults.[16]

Children's time use does have an important gender dimension to it. Girls spend more hours engaged in productive activities (and less time in leisure) than boys. This is true regardless of children's age or whether or not they attend school. In addition, while school-going girls continue to work longer hours than school-going boys, they also forego a greater number of

[15] Labor force work is defined here to include helping with farm work as well as working for money. Household work is defined to include taking care of younger children, doing household chores, or fetching water. Calculations are based on a 5 day school week.

[16] For example, the LFS data indicate that average amount of time worked on labor force activities for economically active adults, aged 22 to 54, is 35 hours per week (41 hours per week for males and 30 hours per week for females).

hours worked than boys by attending school. In other words, households lose a greater number of hours worked when they send girls to school than when they send boys.

Table 6: Children's Weekly Time Use in Tanzania, by Gender and Age Cohort, 1993^

Average Hours Per Worked per week, Based on HRDS Timelog Data

	Males				Females			
Age	Hours Worked, Children not in School	Hours Worked, Children in School	Hours in School or on School Work	Hours Work Foregone by School Children.	Hours Worked, Children not in School	Hours Worked, Children in School	Hours in School or on School Work	Hours Work Foregone by School Children
	(1)	(2)	(3)	(4) = (1)-(2)	(5)	(6)	(7)	(8)= (5)-(6)
7-9	24.0	5.9	38.4	18.1	31.5	12.3	35.8	19.2
10-12	32.9	9.7	39.3	23.2	36.6	10.0	42.5	26.6
13-15	33.8	8.5	47.3	25.3	48.6	11.8	47.9	36.8
16-18	45.5	9.3	49.7	36.3	47.5	10.2	48.6	37.3
19-21	36.1	13.6	39.6	22.4	50.5	31.0	21.2	19.5

Average Hours Per Worked per week, Based on FAST Survey Data

	Males				Females			
Age	Hours Worked, Children not in School	Hours Worked, Children in School	Hours in School or on School Work	Hours Work Foregone by School Children	Hours Worked, Children not in School	Hours Worked, Children in School	Hours in School or on School Work	Hours Work Foregone by School Children
	(1)	(2)	(3)	(4) = (1)-(2)	(5)	(6)	(7)	(8)= (5)-(6)
7-9	21.3	12.4	27.2	8.9	35.2	21.1	24.7	14.1
10-12	34.3	17.0	30.1	17.3	49.0	17.4	31.8	31.6
13-15	36.8	12.1	39.3	24.7	54.0	17.5	40.1	36.5
16-18	34.8	8.7	41.0	26.1	56.6	20.9	40.6	35.7
19-21	46.4	10.0	43.8	36.4	54.6	n/a	n/a	n/a

What does this information imply for the opportunity cost of children's time? This depends in part on how one values children's time, particularly time spent on unpaid or household work. Valuing-unpaid work can be difficult as, in many cases, there is no direct

market substitute to serve as a benchmark for calculating its value. Tzannatos (1995) outlines four main wage-based methods of assessing the value of unpaid work that is used in the literature. In the first method, time in household production is assigned the value of the wages of substitute workers who could be hired in the open market to perform the activities currently being undertaken by household members for no pay. In the second method, time in household production is assigned the value of the wages of workers performing, in market enterprises, functions equivalent to the specified household activities. In the third method, time in household production is assigned the value of earnings foregone in the market of those members who, instead of working, spend time on household activities. In the fourth method, time in household production is simply assigned the value of the average wage for market workers, differentiated by gender, age and education, or the market wages of workers with qualifications similar to those required for performing household tasks. An alternative to wage-based methods in valuing unpaid household work, also cited by Tzannatos (1995), are output-based methods of valuation, where the market value of output produced in the home is used to impute the value of time used to produce it.

In this paper, the opportunity cost of children's time is measured in two ways, with the valuation of children's time guided both by data constraints and conceptual issues. In both cases, the "opportunity hours" of children's time is valued as the hours of work foregone per week due to school and school work.. Then these opportunity hours are valued at the average predicted market wage, given the age, education level and the gender of the child. In other words, opportunity hours are valued according to the fourth method described above.[17] Using predicted market wages that are gender specific leads to valuation of girls' time that is much below that of boys, even when education is controlled for. Even though girls generally have greater opportunity hours than boys, the opportunity cost appears to be less than that for boys (Table 7, A).

Estimates of the opportunity cost of girls times using predicted market wages for females is problematic however. This is because although observed market wages are lower for females than for males, there is no evidence that girls' productivity is any lower than boys' in this context. The structure of market wages, in addition to reflecting in historical equalities in human capital formation between males and females, tend to reflect employers' concerns about women's intermittency in the work force (due to child bearing, for example) and perhaps gender-based labor market discrimination. As a result, girls' opportunity hours are also valued at boys' predicted wage levels (Table 7, B). This provides estimates of the opportunity cost of children's time that values opportunity hours for boys and girls equally. Not surprisingly, valuing girls' opportunity hours at boys' wages leads to substantial increases in the estimated opportunity cost of their time. Increases range from 40 percent for 19 to 21 year-olds to three-and-a-half times for 7 to 9 year olds. In all cases, except for 19 to 21 year olds, the change in the valuation of girls'

[17] Using hours of work foregone provides a lower bound of the time costs of schooling, but allows one to take account of gender- and age-based differences in time allocation between schooling and other activities.

time leads to the opportunity cost of girls' time exceeding boys' -- the relative magnitudes reflecting the hours of work foregone by their households (Table 7, B).

Table 7: The Opportunity Cost of Schooling per Month in Tanzania, 1993, Valued at Predicted Rural Wage Levels^

A. Girls' and boys' time valued at their predicted wage levels

	HRDS Time Use		FAST Time Use	
Age	Males	Females	Males	Females
7-9	552.68	156.45	271.74	114.87
10-12	1,142.99	741.80	852.31	881.24
13-15	1,377.14	1,299.86	1,344.46	1,289.27
16-18	2,600.98	1,709.15	1,870.13	1,635.86
19-21	1,779.04	1,095.02	2,890.94	n/a

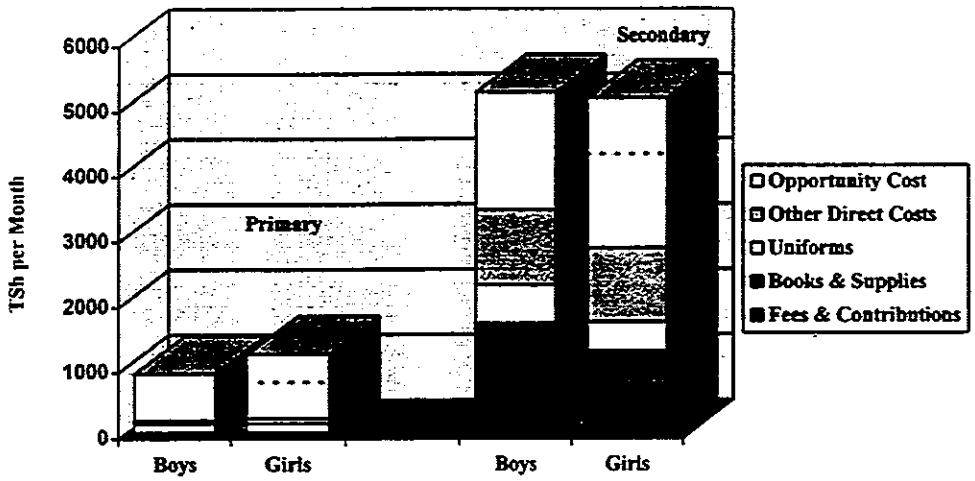
B. Girls' and boys' time valued at boys' predicted wage levels

	HRDS Time Use		FAST Time Use	
Age	Males	Females	Males	Females
7-9	552.68	586.24	271.74	430.54
10-12	1,142.99	1,310.48	852.31	1,556.81
13-15	1,377.14	2,003.11	1,344.46	1,986.77
16-18	2,600.98	2,672.63	1,870.13	2,557.97
19-21	1,779.04	1,548.75	2,890.94	n/a

^ "Opportunity hours" defined as average hours of work foregone per month due to schooling (i.e., the monthly equivalents of columns (4) and (8), Table 5).

To put these values in context, it is worth comparing the opportunity cost of children's time with the direct costs of schooling at the primary and secondary levels. Such a comparison is presented graphically in Figure 6. This figure is intended to be illustrative. The opportunity cost of girls' time is shown valued at boy's predicted wages. However, the dotted line across the girls' opportunity cost segment shows how girls' time would be valued at girls' predicted wages, and hence provides a range of values for the opportunity cost of girls' time.

Figure 6: The "Full" Private Costs of Primary and Secondary Schooling in Tanzania, 1993, by Gender



In any case, the figure presents a striking picture. At the primary school level, the value of children's work foregone (when they attend school) swamps the direct expenditures that Tanzanian households make, on average. The data suggest that the opportunity cost of children's time is between two-and-a-half and three times the value of average direct expenditures on primary education in Tanzania. At the secondary level, the value of children's time is higher in absolute terms, but lower relative to the direct costs of secondary education. In this case, the value of children's work foregone ranges from 50 to 80 percent (for boys and girls, respectively) of the average direct costs secondary schooling.

Neither the HRDS nor the LFS surveys have sufficient data to compute reliable estimates of the discounted costs and benefits of primary and secondary education in Tanzania. Moreover, care must be taken in comparing the findings on costs and benefits because the data are from two different years. Nonetheless, the evidence presented above suggests several possible explanations for the observed patterns of enrollment in Tanzania (Figures 1 and 2; Table 1). First, although the findings are not conclusive, some evidence suggests that private returns to education declined between 1980 and 1990. If so, this would help to explain declining primary school enrollment rates over the period. Even with apparent declines, however, primary

enrollment rates remain consistent with enrollment rates for other low-income countries in sub-Saharan Africa. This appears to be the case because the relative costs and benefits of schooling at the primary level make it an attractive investment for most households. Even if the private returns to schooling are not very large, the costs of primary education are extremely low. The direct costs comprise less than 6 percent of per capita expenditure among households in the poorest quintile (Figure 4); and even accounting for the opportunity costs, the full costs at the primary level remain manageable for most households. For the majority of households, therefore, primary education appears to be both an affordable and "profitable" investment.

Questions remain regarding the relative costs and benefits of education at the secondary level, however. While the wage function estimates indicated that private returns to secondary education are roughly the same in percentage terms as those at the primary level, secondary school direct and indirect costs are 4 to 5 times larger. These dramatically higher costs have several possible implications from the household's perspective. First, given dramatically higher costs, many households may not find secondary education an attractive investment. Particularly in rural areas where the likelihood of obtaining a job in the formal wage sector is extremely low, households may not consider investment in secondary education worthwhile. Moreover, given the size of secondary school costs relative to household incomes, many households, particularly among the poor, may find secondary education unaffordable. Especially if borrowing for education purposes is limited or non-existent, even when households perceive investment in secondary education as profitable, they may not have the means to finance it.

5. The Determinants of School Enrollment and Late Starting

While the discussion above provides valuable information on the costs and benefits of primary and secondary education and on how their relative magnitudes may affect schooling outcomes, the analysis furnishes only limited information on how policy makers might intervene to improve schooling outcomes. A number of individual-, household- and community-level factors combine to influence the benefits and costs of schooling, factors that affect both the supply and demand for education. However, the foregoing analysis does not enable one to disentangle which of these factors drive household decisions to invest in schooling. For example, are the direct costs of schooling or the opportunity costs more important in determining primary or secondary enrollment or late starting? To what extent is household income (or the lack of it) really instrumental in determining enrollment or late starting decisions, or are other household characteristics driving the choices? How important are community-level constraints, such as the supply of schools, in determining household enrollment or late starting decisions? Do these factors affect girls' and boys' schooling differently? Obtaining answers to all of these questions is critical to developing policy and project interventions that are effective in improving schooling outcomes. To answer these questions, a more formal analysis of the determinants of enrollment and late starting is required.

Analyzing the determinants of enrollment and late starting econometrically allows one to quantify the impact of the key factors influencing household schooling decisions, holding other factors constant. Moreover, such analysis allows one to evaluate the extent to which schooling outcomes can be improved by changing the key factors that determine enrollment and late starting.

5.1 Conceptual Framework

Although the early human capital literature focused on investment in education as an individual decision (see Becker, 1967; Mincer, 1974), more recent literature on schooling choice has focused on the household as the unit of decision. Much of the recent modeling of enrollment decisions has adopted a framework in which the enrollment choice depends upon households trading off current consumption of the parents (or the household at large) against higher future earnings of the children. The enrollment choice is commonly modeled as a single-period decision in which the household chooses to invest in an additional year of schooling for children if the incremental benefit from that investment equals or exceeds or marginal costs of doing so (King and Lillard, 1983; Gertler and Glewwe, 1989, 1992; Khandker et al, 1994; King, 1995; Khandker, forthcoming). Lavy (1992), building on the life-cycle earnings literature, develops an intertemporal model of schooling choice in which the decision to enroll in school and the duration of attendance is influenced by the marginal costs and returns associated with schooling as well as by the market rate of interest. Education returns in this model are not only associated with the wage for educated labor, but by the efficiency (or quality) of schooling.

The recent literature on late starting has also tended to model the timing of educational investments in a dynamic framework to capture the over-time aspects of the decision (Glewwe and Jacoby, 1992, 1995). Out of this class of models come three hypotheses regarding late starting. Under the first hypothesis, late starting is associated with credit constraints and positive school fees. Glewwe and Jacoby (1992) demonstrate that in the absence of credit constraints, income is not an important determinant of late stating since parents can always borrow to finance education or smooth consumption. In the presence of borrowing constraints and positive school fees, however, parents sometimes delay enrollment, putting the child to work to accumulate savings. This savings is used to smooth consumption when the child eventually attends school. Under this hypothesis, household income will not be an important determinant of late starting unless there are borrowing constraints (and sufficiently large school fees).

Under the second hypothesis, delayed enrollment is related to a child's physical and mental "readiness" for school. In Glewwe and Jacoby (1995), the authors show that longer delays will be associated with higher levels of malnutrition. The impact of malnutrition on the timing of enrollment can be measured using anthropometric data, such as child height-for-age. Under the third hypothesis, late enrollment is associated with school supply constraints. While they do not model it formally, Glewwe and Jacoby (1995) argue that if scarce primary school slots are rationed by giving preference to older children, a child who is not given admission at

age seven may well be permitted to enroll at age eight or nine. This hypothesis implies that children will start later, on average, in communities with relatively tighter supply constraints.

Although the precise variables included in these models of household schooling decisions differ, they commonly include household income (or consumption), the "price" of schooling, including the direct and indirect costs, and a often a vector of fixed individual, household, and community characteristics that affect the efficiency of education. These characteristics can include school quality, parent's education levels, and the features of the economic environment that affect returns to schooling. In estimating the key determinants of school enrollment and late starting, this paper follows this general framework. In the context of the late starting equation, the two hypotheses regarding credit constraints and school supply constraints are tested explicitly. No data are available on malnutrition, so this hypothesis cannot be tested in the empirical model.

5.2 Empirical Model and Specification

The determinants of school enrollment are estimated separately at two points in the schooling cycle. The first equation estimates the determinants of enrollment into primary school (i.e., the decision to enroll in school at all), while the second equation estimates the determinants of enrollment into secondary school. These equations are intended to capture enrollment decisions at two key points in the schooling cycle. Estimating the determinants of secondary school enrollment is of particular policy interest in light of Tanzania's extremely low enrollment rates at this level.

The determinants of primary and secondary school enrollment are estimated using probit models. Probit models estimate the probability of an individual enrolling in school, given a set of individual, household, community-level characteristics.[18] The primary school probit equation estimates the unconditional probability of an individual enrolling in school. The dependent variable equals 1 if the person has ever enrolled in school, and 0 if the person has never enrolled. Probit equations are estimated for all children, aged 7 to 15, as well as for boys and girls separately. The 7 to 15 age cohort is chosen because although age 7 is the official starting age, the prevalence of late starting means that much older children also are involved the school enrollment decision. The HRDS data suggest, however, that by age 15 nearly all children who are going to enter school have already enrolled. Over 90 percent of those children enrolled in primary school at the time of the HRDS survey fall into the 7 to 15 year-old age range..

The secondary school probit equation estimates the probability of a child enrolling in secondary school, given that the individual has graduated from primary school. As with the primary school enrollment equation, the probit model is estimated for boys and girls together as

[18] Limited dependent variable models, such as probits and logits, have been used extensively in the recent empirical literature to estimate the probability of school enrollment (see, for example, Lavy, 1992; World Bank, 1993; Khandker et al, 1994; King, 1995; and Khandker, forthcoming).

well as separately. In the case of the secondary school enrollment equations, the estimation is done on the sub-sample of individuals aged 14 to 22. This, again, is done to capture the group individuals for whom the secondary enrollment decision was recent. As in the case of the primary enrollment equation, this sub-sample covers over 90 percent of those enrolled in secondary school at the time of the HRDS survey. Unlike in the primary enrollment equation, an individual is included in the estimation sub-sample conditional upon their having completed primary school. This is done under the assumption that graduating from primary school is a necessary condition for advancing into secondary school (and therefore necessary to making the enrollment decision).

The determinants of late starting are estimated using a Cox regression model. Cox regression models are hazard models used to estimate the probability of an event occurring during a given time period, given a vector of fixed characteristics. In the context of late starting, the Cox regression presented below estimates the probability of an individual enrolling in primary school at a particular age, given their individual, household and community characteristics. The dependent variable in the Cox regression is number of years late in enrolling (i.e., age of initial enrollment minus 7, the official starting age for primary school). Further, Cox regressions are capable of handling censored data on late starting that is often observed in household surveys. Data censoring occurs because the number of years late in enrolling is only observed for people who have already enrolled; no information is available on the timing of enrollment for those who have not enrolled (but who might potentially enroll in the future). As in the case of the primary enrollment equation, the Cox regression is estimated for all children and on boys and girls separately, aged 7 to 15.

The variables included in the enrollment and late starting equations are consistent with the conceptual framework outlined above and include individual, household, and community characteristics that influence the nexus of costs and benefits households face when making their schooling decisions.[19] In terms of costs, variables measuring both the direct and indirect costs of schooling are included in the specification. No information on school-level fees are reported in the data. As a result, the direct costs of schooling are measured by per student expenditure on "non-discretionary" items, including fees, contributions, and the cost of study materials, averaged at the district level. Averaging at the district level eliminates the selectivity bias associated with individual or household-level school expenditures. In the primary enrollment and late starting equations, a single direct cost variable is included in each equation. In the secondary enrollment equation, public and private school costs are included as separate variables. Recent studies have discussed quality differences between public and private secondary schools (Cox and Jimenez, 1991, World Bank, 1995a). Specifying the direct costs separately for public

[19] See Appendix Tables 4 and 5 for summary statistics on the explanatory variables used in the enrollment equations.

and private schools is done to distinguish between any differential effects on enrollment decisions.[20]

A variable measuring the distance from households to the nearest school is also included to capture the costs, both in terms of money and time, of traveling to and from school. Wages for unskilled labor, averaged at the district level, and district-level labor force participation rates for children aged 7 to 15 and 14 to 22 are included in the estimating equations to capture the opportunity cost of children's time. Both the wage and labor force participation rate variables are specified separately for boys and girls. The distance of the household to the nearest water source is also included in the specification to capture trade-offs between household work and participation in school, particularly for girls. A variable measuring the number of adults in the household is also included in the specification to capture possible substitutes for child labor.

Factors that influence children's learning capacity, the quality of schooling, and the local economic environment critically affect the returns available to education. In this context, proxies for children's learning capacity, school quality, and the local economic environment are included in the estimating equations. Higher levels of parental education is often associated with a better home learning environment and child preparation to learn effectively in school. To capture this, parents' education levels are included in primary enrollment and late starting equations.[21] The HRDS survey does not contain complete information on parents' education levels for children over 15, however. As a result, for the secondary enrollment equations, variables measuring the education of the household head and household head's spouse were used instead. Primary school quality is proxied by a measure of per capita government expenditure on primary schools at the district level.[22] No analogous data are available at the secondary level. Dummy variables controlling for the main geographic regions and for the presence of electricity within a village are included in the equations to capture key characteristics of the economic environment and the presence of economic infrastructure.

Variables measuring household expenditure and "access" to schooling are included in the estimating equations to capture potential household and community constraints to school participation. Analysis of the costs of secondary schooling indicated a particularly high cost burden among the poor (Figure 4). A variable measuring per capita household expenditure is thus included in equations to evaluate the role of income (and income constraints) on enrollment and late starting decisions. This variable also allows testing of the "credit constraint" hypothesis

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[20] To some extent, any measure of the direct costs of schooling is going to reflect school quality and, hence, there is some risk of capturing quality as well as price effects. Assuming quality can be adequately controlled for, pure price effects can be isolated. A proxy for school quality at the primary level has been included in an attempt to control for school quality (see below). Moreover, alternative definitions of direct costs were examined in an attempt to purge quality effects from price. Although the details are not reported here, the alternative direct cost measures performed similarly in the enrollment and late starting equations.

[21] Parent education levels may also influence enrollment decisions by affecting parents' perceptions regarding the value of education.

[22] No school characteristics are available in the data.

of late starting. Because of the endogeneity of expenditure and schooling decisions, an instrumental variables approach is adopted and fitted values for expenditure included in the estimating equations. Two different variables are included to capture "access" to schooling at the primary and secondary levels. At the primary level, access is represented by a variable that measures the number of schools per 1,000 population in a district; at the secondary level, access is proxied by a dummy variable capturing whether the individual was selected for further education based on the primary school leaving exam.[23] The primary-level access variable is also critical to testing the hypothesis that supply constraints are instrumental late starting decisions.

Child's sex and relationship to the household head are included in the specifications to capture household preferences. Regardless of the relative returns to boys' and girls' education, parents may perceive the value to the household of girls' and boys' education differently. Moreover, multiple families living a single household is quite common in Tanzania. Whether a child is a member of the immediate or extended family may also affect perceptions about the likely returns to education for the household and, hence, the households' willingness to invest in the child's education. Finally, a variable measuring the proportion of 14 to 25 year-olds in a locale (cluster) that attend secondary school is included in the primary school equations to capture potential "role model" effects on enrollments.

5.3 The Data. The enrollment and late starting equations are estimated using data from the HRDS and LFS surveys. The HRDS, a 4,953 household survey collected from all 20 regions of mainland Tanzania, provides the core data for the estimations, including information on household expenditure, demographic structure, education. Limited data are also available in the HRDS on community characteristics. Data on wage for unskilled labor (the opportunity wage) are derived from earnings function estimates using the LFS survey. Coefficient estimates from the earnings functions (Appendix Table 2) and sample selectivity correction factors were used to predict wages for potential primary and secondary school entrants in the HRDS, based on their age and years of schooling. Predicted wages were then averaged at the district level. Labor force participation rates for school-aged children were taken directly from the LFS survey and linked district-by-district to the HRDS data through a series of identification codes. In a limited number of cases, districts sampled in the HRDS could not be matched to districts from the LFS, either in generating the opportunity wage or in linking the labor force participation variables. To help preserve sample sizes in the estimating equations, "missing" wage and labor force participation dummy variables were generated.

5.4 Primary Enrollment. The results of the primary school enrollment equations provide several valuable insights into household schooling decisions at the primary level (Table 8). With respect to the costs of schooling, for example, neither primary school direct costs nor distances to schools appear to have significant impacts on the decision about whether to enroll children in school. This is not particularly surprising, given that primary school direct costs are

[23] A test for endogeneity was conducted on this variable. The variable was found not to be endogenous.

Table 8: The Determinants of Primary School Enrollment in Tanzania, 1993, by Gender

	Males and Females		Males only		Females only	
Explanatory Variable	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Individual Variables						
Age	1.586	16.00	1.286	9.37	1.934	13.11
Age Squared	-0.053	-11.65	-0.039	-6.16	-0.069	-10.23
Relationship to Household Head (not child or grandchild = 1)	-0.076	-0.82	0.137	1.00	-0.248	-1.97
Gender Dummy (male=1)	-0.176	-3.62				
Household Variables						
Per Capita Expenditure (fitted)	1.9e-06	1.62	2.5e-06	1.56	1.4e-06	0.86
Father's education	0.020	2.09	0.020	1.44	0.021	1.56
Mother's Education	0.015	1.72	0.005	0.42	0.025	1.97
Number of Adults in Household	0.031	1.77	0.029	1.21	0.032	1.27
School Variables						
Primary Direct Costs	9.4e-05	1.53	1.4e-04	1.60	3.9e-05	0.44
Costs-Relationship to Household Head Interaction	-1.1e-04	-0.87	-1.7e-04	-0.92	-6.6e-05	-0.38
Distance to Primary School	1.7e-04	0.38	3.3e-04	0.48	1.2e-04	0.19
Number of Schools per 1,000 Population/District	0.829	3.47	0.906	2.46	0.800	2.27
Per Capita District Expenditures on Primary Schools	-0.089	-0.71	-0.210	-1.17	-0.009	-0.05
Community/Regional Variables						
Proportion of 14-25 Year-olds in Secondary School (Cluster)	0.691	2.69	0.893	2.46	0.498	1.34
Opportunity Wage, Male	0.012	0.62	0.025	0.97	0.002	0.08
Opportunity Wage, Female	-0.225	-4.24	-0.218	-2.92	-0.223	-2.90
Male Wage Variable Missing	-0.172	-0.67	0.183	0.48	-0.456	-1.28
Female Wage Variable Missing	0.032	0.25	0.144	0.79	-0.043	-0.22
Labor Force Participation Rate, Male	0.577	1.97	0.848	2.09	0.313	0.72
Labor Force Participation Rate, Female	-0.847	-2.78	-1.386	-3.28	-0.293	-0.65
Labor Force Participation Rate Variable Missing	-0.120	-0.50	-0.682	-1.88	0.406	1.20
Distance to water source	-9.3e-04	-1.73	-6.4e-04	-0.96	-0.001	-1.43
Presence of electricity	0.148	1.71	0.113	0.94	0.197	1.56
Dar es Salaam	-0.435	-1.64	-0.573	-1.56	-0.258	-0.66
Other Urban	0.020	0.22	-0.298	-2.30	0.298	2.14
Constant	-10.676	-18.53	-9.265	-11.79	-12.631	-14.94
Sample Size	4,689		2,385		2,304	
Log Likelihood		-1,718.2		-891.8		-806.0

relatively small compared to either household income (Figure 4) or the opportunity cost of primary schooling (Figure 6) and that primary schools are located in nearly every village.

The opportunity cost of children's time, however, does appear to exert a significant influence on household enrollment decisions at the primary level. In particular, the estimations indicate that an increase in the opportunity cost of girls' time, results in a decline in the likelihood of a child enrolling in school. This appears to be true regardless if the child is a girl or a boy. For girls, the story is straightforward. As the value of female labor increases (either inside or outside the home), the probability of girls enrolling falls. For boys, the coefficient estimates in the "Males only" equation indicate that an increase in the female opportunity wage or the female labor force participation rate would lead to a decline in the probability that boys will enroll in primary school. These results, significant at the 5 percent level, suggest that complex inter-linkages exist between boys' and girls' labor in the household's production function.[24] Contrary to expectations, the coefficient on boys' labor force participation rate is positive and significant, suggesting that a higher opportunity cost increases the probability of boys enrolling into school. Such a situation would be plausible if the labor force participation rate for unschooled boys were closely correlated with the participation rate for more educated labor. Under such circumstances, a positive coefficient would reflect the effect of the demand for educated labor on the primary school enrollment decision.

Two other coefficient estimates lend support to the notion that the opportunity cost of children's time plays an important role in determining primary school enrollment. First, in the joint equation, as the distance to the household water source increases, the likelihood of enrolling in primary school falls. Second, also in the joint equation, the coefficient on "number of adults" in a household is positive and significant at the 10 percent level. Holding income constant, this suggests that additional adult labor can substitute for child labor, freeing children to participate in schooling.

In terms of the factors that affect the benefits associated with education, parents' education levels have a positive and significant impact on the probability of enrolling in primary school. Mother's education exerts a particularly strong influence on the likelihood of girls enrolling in school. This finding is consistent with recent evidence from other countries (Khandker, et al, 1994; Khandker, forthcoming). The presence of electricity also appears to have a positive impact on the probability of enrollment -- although the coefficient is only significant in the joint equation at the 10 percent level. School quality, at least as proxied by per capita government expenditure, has no significant impact on the likelihood of a child enrolling in primary school.

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[24] For example, holding female labor force participation constant, the negative coefficient on the female opportunity wage suggests that boys' labor is a complement to girls' labor within the home. However, holding the girls' opportunity wage constant, the negative coefficient on female labor force participation suggests that boys' labor can substitute for girls' within the household if increased demand draws girls' labor from the household into the labor market.

The estimations also suggest that school supply constraints significantly affect primary school enrollments. The positive coefficient on the "number of schools per 1,000 population in a district" indicates that, holding distances to schools constant, the greater number of schools per capita, the greater the likelihood of a child enrolling. This finding is particularly robust; it is significant at the 5 percent level in the joint equation as well as in the males and females only equations.

Several other results are worth noting. Per capita expenditure has little or no influence on primary school enrollments; the coefficient is not significantly different than zero at the 10 percent level. Hence, consistent with the descriptive evidence presented earlier (Figure 1; Table 1; Figure 4), income does not appear to be a significant determinant of primary school enrollment. Both sex and position within the household, however, affect the probability of enrolling in school. The joint equation indicates, for example, that girls have a higher probability of enrolling in primary school than boys, once other factors are controlled for. At the same time, the "females only" equation suggests that members of the immediate family (i.e., children or grandchildren) are more likely to enroll in primary school than extended family. Finally, the joint and males only equations indicate that role model effects have a positive and significant influence on the likelihood of enrolling in primary school.

5.5 Secondary Enrollment. As with the primary enrollment equations secondary school direct costs appear to have no significant influence on the probability of enrollment (Table 9). Only in the "Males only" equation is the coefficient on private school direct costs fees significant (at the 10 percent level) and positive. This positive impact on the probability of enrollment may be picking up school quality embedded in the direct costs, since no variables are available at the secondary level to control for school quality.[25] In contrast to the situation at the primary level, however, distances to both public and private secondary schools have a negative influence on the probability of secondary enrollment. This effect is due to the fact that, holding other factors constant, greater distances result in higher costs in either time or money with respect to travel and perhaps boarding. Boys' enrollments appear to be affected by distances to public schools, whereas girls' enrollments are influenced by distances to private schools.

[25] Although an effort was made to define the direct costs variables so to minimize the quality embedded in them, it is likely that the absence of adequate controls for school quality biases the estimates of all the direct cost variables upward. In other words, with appropriate controls for quality, a significant negative price effect on enrollment at the secondary level may well have been observed. Future education sector analysis in Tanzania (and elsewhere) would thus benefit from efforts to collect data on school-level characteristics that reflect quality, such as average teacher schooling, training, and experience, school level fee structures, and presence of educational infrastructure, including, for example, desks, blackboards, textbooks. The weak performance of the secondary school direct costs variable may also reflect another complication that cannot be controlled for in the data. School fees in the estimating equations are measured as averages at the district level. However, since children to not necessarily attend schools in the districts that they live, some measurement error is introduced that effects the efficiency of the estimates. No information is reported in the HRDS on the location of the secondary school actually attended. Thus, it is impossible to correct econometrically for this problem.

Table 9: The Determinants of Secondary School Enrollment in Tanzania, 1993, by Gender

	Males and Females		Males only		Females only	
Explanatory Variable	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Individual Variables						
Age	0.893	2.45	0.364	0.72	1.229	2.19
Age Squared	-0.023	-2.34	-0.008	-0.60	-0.032	-2.12
Relationship to Household Head (not child or grandchild = 1)	-1.389	-2.58	-0.469	-0.86	-1.254	-2.26
Gender Dummy (male=1)	0.099	1.13				
Household Variables						
Per Capita Expenditure (fitted)	6.5e-06	2.88	5.8e-06	1.72	5.9e-06	2.00
Household Head's Education	0.065	3.52	0.064	2.30	0.067	2.48
Spouse's Education	0.032	1.79	0.020	0.80	0.043	1.58
Spouse's Education Missing	0.299	2.10	0.055	0.27	0.574	2.62
Number of Adults in Household	0.125	4.53	0.106	2.59	0.153	3.81
School Variables						
Secondary Direct Costs (Gov't)	-2.3e-06	-0.11	-1.5e-06	-0.57	1.9e-05	0.58
Secondary Direct Costs (Private)	1.1e-06	0.18	1.5e-06	1.82	-1.2e-05	-1.37
Costs (Gov't)-Relationship to Household Head Interaction	-2.9e-05	-0.67	5.1e-05	0.79	-8.1e-05	-1.19
Costs (Private)-Relationship to Household Head Interaction	1.3e-05	0.98	-2.4e-05	-1.11	3.5e-05	1.83
Distance to Sec. School (Gov't)	-0.004	-2.67	-0.007	-2.85	-0.002	-0.89
Distance to Sec. School (Private)	-0.003	-1.81	-0.001	-0.50	-0.006	-1.83
Selected for Further Study (Primary Leaving Exam)	0.319	1.18	-0.097	-0.20	0.468	1.34
Community/Regional Variables						
Opportunity Wage, Male	-0.016	-0.78	-0.033	-1.08	0.032	1.02
Opportunity Wage, Female	-0.019	-0.75	0.033	1.01	-0.140	-2.19
Male Wage Missing	-0.077	-0.23	-0.977	-1.68	0.596	1.24
Female Wage Missing	-0.246	-0.90	-0.189	-0.51	-0.630	-1.24
Labor Force Participation Rate, Male	-0.091	-0.15	0.005	-0.01	0.151	0.18
Labor Force Participation Rate, Female	0.519	0.70	0.897	0.81	0.335	0.31
Labor Force Participation Rate Missing	0.441	1.22	1.879	3.07	-0.295	-0.56
Distance to water source	0.002	2.24	0.002	2.21	-0.001	-0.15
Presence of electricity	-0.044	-0.32	0.095	0.46	-0.094	-0.49
Dar es Salaam	-0.711	-1.88	-0.694	-1.17	-0.556	-1.05
Other Urban	0.132	0.76	0.193	0.73	0.216	0.81
Constant	-11.060	-3.30	-6.767	-1.44	-13.96	-2.70
Sample Size	1,680		750		930	
Log Likelihood		-556.2		-281.5		-255.0

Although children do not necessarily attend the nearest secondary school in Tanzania, the spatial distribution of secondary schools broadly affects their accessibility and, hence, the costs associated of attending.

As in the case at the primary level, the opportunity cost of girls' time has a significant influence on the enrollment decision. An increase in the female opportunity wage negatively affects the probability of girls enrolling at the secondary level. This effect is statistically significant at the 5 percent level. Moreover, even more strongly than at the primary level, the number of adults present in the household is a significant determinant of secondary school enrollment.

Consistent with the findings at the primary level regarding parents' education, the education level of the household head has a strongly significant impact of the probability of secondary school enrollment. This effect is significant in both the joint and gender-specific equations at the 5 percent level. In the joint equation, education of the household head's spouse also has a positive impact on the probability of secondary enrollment, although only at the 10 percent level. In contrast to the primary level, per capita expenditure exerts a significant positive impact on the likelihood of enrolling into secondary school. The coefficient on expenditure is significant at the 5 percent level in the joint and "Females only" equations and at the 10 percent level in the "Males only" equation. This finding is consistent with the descriptive analysis presented above (Figure 1; Table 1; Figure 4). And although the gender dummy does not indicate significant differences in the probability of girls and boys enrolling in school, holding other factors constant, girls' relationship to the household head does make a difference. Girls who are immediate family members are significantly more likely to enroll in secondary school than those who are extended family members.

5.6 Late Starting. The coefficients in the late starting equations indicate how the explanatory variables effect the probability of delayed school enrollment. Thus, a negative coefficient indicates that the explanatory variable reduces the probability of late starting, while a positive coefficient indicates that the variable increases the probability of late starting. Overall, the estimating equations suggest that the determinants of late starting are generally consistent with those that determine primary enrollment (Table 10). For example, the higher the opportunity cost of girls' time, for example, the more likely children are to delay entry. Conversely, parent education levels are inversely related to the probability of starting late.

So how do the results in the late starting equations relate to the two testable hypotheses discussed earlier: first, that borrowing constraints, and, second, that school supply constraints explain late starting? Consistent with the primary enrollment equations, the per capita expenditure (income) variable is not significantly related to late starting. This would suggest that borrowing constraints do not affect households' decisions regarding the timing of entry into school. At the same time, the fact that opportunity cost plays a significant role in households'

Table 10: The Determinants of Late-starting at the Primary Level in Tanzania, 1993, by Gender

	Males and Females		Males only		Females only	
Explanatory Variable	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Individual Variables						
Age	-0.990	-10.67	-0.836	-6.27	-1.145	-8.77
Age Squared	0.037	9.51	0.031	5.43	0.044	7.97
Relationship to Household Head (not child or grandchild = 1)	0.090	1.25	0.053	0.52	0.098	0.97
Gender Dummy (male=1)	0.226	6.09				
Household Variables						
Per Capita Expenditure (fitted)	-9.9e-07	-1.14	-1.7e-06	-1.33	-5.3e-07	-0.43
Father's education	-0.015	-2.00	-0.012	-1.12	-0.018	-1.68
Mother's Education	-0.015	-2.20	-0.009	-0.85	-0.021	-2.17
Number of Adults in Household	-0.018	-1.40	-0.021	-1.14	-0.015	-0.84
School Variables						
Primary Direct Costs	2.1e-05	0.49	2.3e-05	0.35	2.6e-05	0.46
Costs-Relationship to Household Head Interaction	1.1e-04	1.19	6.7e-05	0.51	1.5e-04	1.10
Distance to Primary School	-2.8e-04	-0.71	-6.5e-04	-1.19	-2.5e-05	-0.05
Number of Schools per 1,000 Population/District	-0.369	-2.01	-0.334	-1.29	-0.445	-1.70
Per Capita District Expenditures on Primary Schools	0.155	1.57	0.198	1.43	0.146	1.03
Community/Regional Variables						
Proportion of 14-25 Year-olds in Secondary School (Cluster)	-0.356	-1.89	-0.535	-1.99	-0.164	-0.62
Opportunity Wage, Male	-7.1e-04	-0.05	9.3e-04	0.04	-0.001	-0.06
Opportunity Wage, Female	0.151	3.21	0.146	2.24	0.144	2.10
Male Wage Missing	0.218	1.15	0.038	0.15	0.391	1.43
Female Wage Missing	-0.089	-0.90	-0.055	-0.40	-0.110	-0.76
Labor Force Participation Rate, Male	-0.510	-2.27	-0.782	-2.39	-0.360	-1.16
Labor Force Participation Rate, Female	0.480	2.05	0.989	2.93	0.048	0.15
Labor Force Participation Rate Missing	0.051	0.29	0.347	1.42	-0.282	-1.09
Distance to water source	7.1e-05	0.15	-2.8e-04	-0.46	2.8e-04	0.39
Presence of electricity	-0.222	-3.55	-0.181	-2.05	-0.265	-2.97
Dar es Salaam	0.118	0.59	0.297	1.05	-0.095	-0.34
Other Urban	-0.023	-0.34	0.198	1.96	-0.242	-2.49
Sample Size	4,645		2,357		2,287	
Log Likelihood		-22545.1		-10137.7		-10383.9

decisions on the timing of school investments suggests that credit constraints may indeed play a role, at least indirectly. In the face of significant opportunity costs to schooling enrolling a child to school implies foregone income (either in cash or kind). Households that delay their child's enrollment as a result of the opportunity cost may well be using this as a consumption smoothing strategy. Such behavior would be consistent with the idea that borrowing constraints are driving the late starting decision. Supply constraints also appear to play a role in the late starting decision. The coefficient on the "number of schools' variable in the join equation is negative and significant at the 5 percent level. This finding is consistent with anecdotal accounts captured in the FAST survey in which parents attributed late starting, in part, to a lack of classroom spaces in primary schools (World Bank, 1995a). The "Female only" equation suggests, however, that supply constraints play a larger role in the timing decision for girls than for boys.

Two additional results are worth mentioning. First, the presence of electricity in a village has a strong negative impact on the probability of delaying entry. The effect is stronger than in the enrollment equations and is significant at the 5 percent level in both the joint and gender-specific equations. Given that the electricity variable is a proxy for economic infrastructure, this result suggests that the timing of school enrollment is responsive to the perceived returns to schooling. Finally, the age and age squared variables in the late starting equations capture cohort effects (Glewwe and Jacoby, 1995). Hence, the negative and significant coefficient on the age variable suggests that older individuals in the sample are less likely to start late. In other words, the estimations suggest that, controlling for other factors, late starting is becoming more prevalent over time.

6. Policy Simulations

The results of the enrollment and late starting equations provide information about which factors significantly affect household decisions to invest in education as well as about the timing of their investment choices. They do not by themselves, however, give us information about the size of the impact on enrollments, for example, of changing the key variables through policy or project investments. To assess the magnitudes of the likely changes, running simulations becomes important.

Given recent concerns about raising Tanzania's extremely low secondary enrollment rates, the simulations focus on increasing the transition rates from primary to secondary school. Simulations are run to assess how intervening in two key policy areas would change the likelihood of primary school graduates enrolling in secondary school (either public or private). These interventions are modeled: 1) compensating households for the direct and indirect costs of secondary school, and 2) reducing distances to schools. The simulations are run by changing the values of the key variables in question, income and distances to schools, holding the value of

other variables at their original levels. The equations are then re-solved using the estimated coefficients. Simulations are run on the joint equations as well as for boys and girls separately.

Three options were explored in terms of compensating households for the costs they incur for schooling their children: 1) compensating households for school fees, contributions and school supply costs; 2) compensating households for the value of the opportunity cost of their children's time; and 3) compensating parents for both school fees, contributions and supply costs *and* the opportunity cost of their children's time. These options were modeled as income effects on the households. In addition, three options were explored with respect to reducing the distances to secondary schools: first, the maximum distance to school was reduced to 15 kilometers; second, the maximum distance to schools was reduced 10 kilometers; and, third, the maximum distance to schools was reduced to only 5 kilometers. Finally, a simulation was run that combined the effects of compensating households for fees, contributions and the opportunity cost of children's time *and* reducing the maximum distance to secondary schools to 10.

Although income is a significant determinant of school enrollment (as timely starting) at the secondary level, the impact of compensating households for the costs of schooling is relatively small in terms increasing the probability that primary school graduates will enroll in secondary school (Table 11). The "Base Case" for the joint equation shows that only 13.4 percent of the sample of primary school graduates examined in the probit model continued on to enroll in secondary school. The simulations suggest that compensating for fees, contributions and school supply costs would only raise this "transition rate" to 14.2 percent (Option 1). Further compensating households for the value of the opportunity cost of their children's time would further increase primary-to-secondary transition rates, but only to about 15.1 percent.

Increases in transition rates associated with reducing distances to schools are also modest. Average distances to public and private schools in the estimation sample are 37 and 25 kilometers, respectively. (See Appendix Table 4.) Nonetheless, the simulations suggest that reducing distances to schools to no more than 5 kilometers from households would only increase transition rates to 16.2 percent (21 percent above current levels). Although changes are small for both boys and girls, the simulations indicate that boys' enrollments are somewhat more sensitive to changes in distances to secondary schools than girls'.[26]

The final simulation, combining interventions that compensate household for costs they incur and reduce distances to schools to no more than 10 kilometers would provide a somewhat larger -- albeit still modest -- impact on primary-to-secondary transition rates. The simulations indicate that under this option transition rates would increase to 17.8 percent, a nearly 33 percent increase in current transition rates.

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[26] This result is similar to that found for boys and girls in rural Peru (Gertler and Glewwe, 1992). Recent analysis of the Philippines, however, indicated that girls' enrollment and grade attainment were more responsive to changes in distances to schools than were boys' (King and Lillard, 1983).

Table 11: Predicted Primary-to-Secondary Transition Rates: Base Case and Following Changes in Key Policy Variables

	Boys and Girls Together	Percentage Increase	Boys Only	Percentage Increase	Girls Only	Percentage Increase
Base Case	0.134	—	0.162	—	0.112	—
Compensate Parents for:						
1. Fees, Contributions and School Supply Costs	0.142	6.4	0.168	3.9	0.118	4.6
2. The Opportunity Cost of Children's Time	0.142	6.1	0.168	3.7	0.118	4.6
3. Combine Options 1 and 2	0.151	12.8	0.175	7.7	0.123	9.5
Reduce Distances to Schools to No More than:						
4. 15 km.	0.155	15.5	0.193	18.8	0.126	11.9
5. 10 km.	0.158	18.0	0.198	22.1	0.128	13.9
6. 5 km.	0.162	21.3	0.204	25.9	0.131	16.7
7. Combine Options 3 and 5	0.178	32.8	0.213	31.2	0.140	24.7

7. Conclusions

Tanzania's secondary school enrollment rates are among the lowest in the world. Late starting is the norm. And while primary enrollment rates are roughly in line with those of other low-income countries in sub-Saharan Africa, Tanzania remains far from achieving universal primary education. In fact, primary enrollment rates actually appear to have declined over the last 10 to 15 years.

What are the key factors driving these outcomes, and what kinds of interventions can improve education sector performance in Tanzania? This paper has sought to provide some answers to these questions. To do so, the paper has used household data from Tanzania to analyze the private returns and costs of primary and secondary schooling, including quantitative estimates of the opportunity cost of children's time. The paper also analyzed the determinants of school enrollment and late starting to clarify how policy might improve schooling outcomes.

Analysis of returns to education in Tanzania suggests that private returns to formal wage employment are relatively low by regional standards. In addition, at least one study suggests that private returns to schooling in Tanzania may have declined during the 1980s (Psacharopoulos, 1994). Care must be taken in interpreting these findings, however. While the majority of the Tanzania population work in informal sectors, including non-wage agriculture, no direct evidence on returns to education are available for these sectors. Moreover, recent policy reforms and the resulting economic changes in Tanzania may well be changing the level and structure of returns to education in the economy. Just how strong private incentives are to invest in education -- particularly at the secondary level -- remains unclear.

Nevertheless, evidence on the costs of primary and secondary schooling does suggest several possible explanations for the patterns of school enrollments observed in Tanzania. For instance, household costs at the primary level are relatively low. The direct costs of sending a child to primary school comprise no more than 6 percent of per capita household expenditure, even among very poor households. And while the opportunity cost of children's time is two-and-a-half to 3 times larger than the direct costs of primary education, the direct and indirect costs together still make up a relatively small proportion of per capita income. If private rates of return have declined over time, this may well have contributed to reported declines in enrollment rates. However, enrollment figures suggest primary education remains an attractive and affordable investment for most households.

The full costs of secondary education are considerably higher than at the primary level. In fact, the combined direct and indirect costs are 4 to 5 times higher at the secondary level than at the primary level. These significantly higher costs make secondary education far less affordable than primary education. Per student direct costs, alone, average 80 percent of total per capita expenditure among households in the lowest expenditure quintile. As a result, in the absence of borrowing opportunities, many households may be unable to finance secondary education. In addition, although direct comparisons between the benefits and costs of schooling are not possible, the full costs of schooling may well affect households' perceptions of the profitability of investing in secondary education.

To isolate the effects of different factors on household schooling decisions, this paper has estimated the determinants of primary and secondary enrollment and late starting econometrically. At the primary level, the estimations indicated that neither the direct costs of primary schooling nor household income significantly affect enrollment or late starting. At the

same time, the analysis indicates that the opportunity cost of children's time is a significant determinant of household schooling decisions. The opportunity cost of girls' time is a particularly important determinant of whether children enroll in school and whether they start on time. Constraints in the supply of primary schools also play a critical role in household enrollment and late starting decisions.

At the secondary level, the opportunity cost of girls' time also has a significant impact on girls' enrollment. In contrast to the primary level, however, household income and distances to schools do play significant roles in household enrollment decisions at the secondary level. This finding on household income is consistent with the school cost analysis, which suggested that households have limited ability to finance education at the secondary level. The fact that distances to schools are a significant determinant of secondary enrollment implies that the monetary and time costs associated with travel to schools (and perhaps boarding) significantly affect secondary enrollment decisions.

Simulation analysis suggests that modest improvements in secondary enrollment rates could be achieved through policies or programs that compensate households for the direct and indirect costs of schooling and that reduce distances to schools. Nevertheless, several key issues remain. The first issue is how important school supply constraints are in determining secondary school enrollments. No direct data on per capita school spaces were available at the secondary level for Tanzania. However, supply constraints were shown to be significant at the primary level (holding distances to schools constant). Given that until recently, the supply of secondary education was severely limited as a matter of policy, supply constraints almost certainly remain central to the enrollment picture at the secondary level.

The second issue concerns education quality. School quality affects returns to education and, hence, household schooling decisions. The key questions are: What factors are important? And, what impact do they make? Insufficient data were available to capture school quality, at either the primary level or secondary levels. However, such data are critical to evaluating just how large an impact quality improvements would make on primary and secondary school participation. Being able to control for school quality would also allow for more accurate estimation of price elasticities of demand for schooling.

The final issue concerns the role of private returns to secondary education in determining secondary school participation. A deeper understanding of economy-wide returns to education is clearly needed. For example, if expected returns to educated labor are low in most sectors of the economy, then education sector interventions alone -- whether they address household demand for schooling or the supply of education -- will be insufficient to induce widespread private investment in secondary schooling. While programs that reduce households' costs will have some impact, ongoing commitment to economic policies that foster broad-based growth and increase demand for educated labor will be essential to increasing participation in secondary education in a sustainable manner.

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Appendix Tables

Appendix Table 1: Primary and Secondary School Enrollment Rates in Tanzania, by Quintile, Gender and Location, 1993

Gross Enrollment Rates

	Lowest Quintile		2nd Quintile		3rd Quintile		4th Quintile		Top Quintile		Average	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Primary School												
Dar es Salaam	n/a	n/a	64	60	79	66	78	80	74	72	75	73
Other Urban	79	94	88	91	90	103	92	86	88	92	89	93
Rural	77	74	75	73	76	96	82	75	90	87	79	80
All Tanzania	77	76	77	76	79	97	85	79	87	86	81	82
Secondary School												
Dar es Salaam	n/a	n/a	n/a	16	10	3	14	21	23	21	18	19
Other Urban	1	2	8	13	6	10	17	22	31	28	15	17
Rural	3	2	6	3	14	5	12	6	15	7	8	4
All Tanzania	3	2	7	5	11	6	14	12	23	17	11	8

Net Enrollment Rates

	Lowest Quintile		2nd Quintile		3rd Quintile		4th Quintile		Top Quintile		Average	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Primary School												
Dar es Salaam	n/a	n/a	53	41	47	46	49	63	51	53	50	54
Other Urban	54	60	57	70	59	68	62	68	69	68	62	68
Rural	50	52	52	53	53	62	51	54	66	65	53	56
All Tanzania	50	53	53	56	54	63	54	59	65	65	55	59
Secondary School												
Dar es Salaam	n/a	n/a	n/a	16	7	0	9	19	18	19	13	17
Other Urban	1	2	8	12	5	6	11	16	22	24	11	14
Rural	2	2	3	3	9	4	9	6	7	5	5	3
All Tanzania	2	2	4	5	8	4	9	10	15	14	7	7

Appendix Table 2: Estimates for Hourly Earnings in Formal Labor Market Activities, By Gender, All Tanzania, 1990/91

	Males		Females	
	Coefficient	t-statistic	Coefficient	t-statistic
Intercept	1.279	8.42	-0.424	-1.90
Some Primary	0.329	5.11	0.902	7.15
Grad. Primary	0.475	7.63	0.897	8.04
Form 2	0.632	6.96	1.176	6.12
Form 4	0.922	13.73	1.436	11.53
Form 6.	0.962	9.53	1.676	8.31
University	1.305	11.77	1.737	5.85
Age	0.053	7.68	0.121	9.83
Age Squared	-0.001	-5.79	-0.001	-7.11
Dar es Salaam	0.332	9.67	0.082	1.36
Other Urban	0.112	3.62	-0.018	-0.34
Lambda	0.015	0.29	0.189	3.65
Log Likelihood	-2,160.06		-1375.10	
Sample Size	2,353		1,882	

Appendix Table 3: Estimates of Hourly Earnings in Formal Labor Market Activities, By Gender and Region, 1990/91

	Dar es Salaam				Other Urban				Rural			
	Males		Females		Males		Females		Males		Females	
	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
Intercept	1.524	8.34	0.028	0.11	1.630	7.50	0.026	0.09	1.203	2.71	-2.363	-2.10
Some Primary	0.308	3.90	0.536	3.23	0.331	3.37	0.220	1.48	0.347	1.86	2.121	4.34
Grad. Primary	0.404	5.51	1.061	7.49	0.555	6.04	0.576	4.64	0.442	2.33	1.132	2.02
Form 2	0.443	4.08	1.429	6.28	0.758	5.78	0.835	4.38	0.633	2.28	---	---
Form 4	0.839	10.50	1.623	10.40	0.935	9.40	1.057	7.85	1.012	4.78	1.747	2.70
Form 6/Univ.	1.144	12.82	1.932	10.01	1.124	8.83	1.454	7.04	0.602	1.43	---	---
Age	0.056	6.45	0.089	6.56	0.036	3.25	0.118	7.18	0.061	3.14	0.204	3.83
Age Squared	-0.001	-4.46	-0.001	-4.20	0.000	-2.00	-0.001	-5.62	-0.007	-2.69	-0.002	-2.96
Lambda	0.103	0.76	0.160	2.70	-0.016	-0.13	0.220	3.73	-0.006	-0.05	0.409	1.34
Log Likelihood	-891.24		-616.50		-905.56		-581.01		-334.66		-137.37	
Sample Size	1,079		978		885		663		389		241	

Note: Due to small data cells, observations for upper secondary school completers and higher have been aggregated for this analysis.

Appendix Table 4: Summary Statistics: Primary Enrollment Equations

Explanatory Variable	Mean	Std. Dev.
Individual Variables		
Age	10.89	2.66
Age Squared	125.57	58.18
Relationship to Household Head (not child or grandchild = 1)	0.16	0.37
Gender Dummy (male=1)	0.52	0.50
Household Variables		
Per Capita Expenditure (fitted)	104,174.30	50,169.57
Father's Education	4.51	3.07
Mother's Education	3.31	3.11
Number of Adults in Household	3.69	1.90
School Variables		
Primary Direct Costs	547.59	559.98
Costs-Relationship to Household Head Interaction	84.91	286.91
Distance to Primary School (km.)	6.75	52.81
Number of Schools per 1000	0.50	0.12
Population/District Per Capita District Expenditures on Primary Schools	0.82	0.30
Community/Regional Variables		
Proportion of 14-25 Year-olds in Secondary School (Cluster)	0.10	0.12
Opportunity Wage, Male	3.17	3.07
Opportunity Wage, Female	0.71	0.84
Labor Force Participation Rate, Male	0.22	0.24
Labor Force Participation Rate, Female	0.20	0.23
Distance to water source	4.61	50.66
Presence of electricity	0.25	0.43
Dar es Salaam	0.03	0.17
Other Urban	0.20	0.40

Appendix Table 5: Summary Statistics: Secondary Enrollment Equations

Explanatory Variable	Mean	Std. Dev.
Individual Variables		
Age	18.54	2.13
Age Squared	348.36	78.48
Relationship to Household Head (not child or grandchild = 1)	0.33	0.47
Gender Dummy (male=1)	0.43	0.50
Household Variables		
Per Capita Expenditure (fitted)	105,591.10	56,122.17
Household Head's Education	4.57	3.19
Spouse's Education	3.05	3.15
Number of Adults in Household	4.81	2.39
School Variables		
Secondary Direct Costs (Government)	4,548.98	2,777.06
Secondary Direct Costs (Private)	18,600.58	9,222.85
Costs (Government)-Relationship to Household Head Interaction	1,435.09	2,578.58
Costs (Private)-Relationship to Household Head Interaction	6,174.66	10,363.98
Distance to Secondary School (Gov't) (km)	37.43	49.07
Distance to Secondary School (Private) (km)	25.30	40.79
Select for Further Study (Primary Leaving Exam)	0.02	0.15
Community/Regional Variables		
Opportunity Wage, Male	6.26	6.36
Opportunity Wage, Female	3.88	4.28
Labor Force Participation Rate, Male	0.20	0.22
Labor Force Participation Rate, Female	0.19	0.20
Distance to water source	3.53	36.04
Presence of electricity	0.36	0.48
Dar es Salaam	0.04	0.20
Other Urban	0.27	0.45

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