Determinants of education attainment and development goals in Yemen [1]

Marco V. Sánchez
Department of Economic and Social Affairs
United Nations, New York, USA
E-mail: sanchez-cantillo@un.org

Giacomo Sbrana
Bureau d'Economie Theorique et Appliquee (BETA)
University of Strasbourg, France.
Email: sbrana@unistra.fr

Abstract

Yemen is off track to achieve the Millennium Development Goal of universal primary education by 2015. Its net enrolment ratio in primary education is far from being satisfactory, especially for females. The empirical analysis of this paper suggests that there is ample scope for Government intervention, though, so as to enable the attainment of education goals, including for higher educational cycles. A key finding is that both development of rural public infrastructure to facilitate travel to school and building of more schools and hiring of more (female) teachers would strongly promote attendance in all educational levels, particularly for females. Interventions that improve child health would also raise enrolment in primary education. Finally, education goals would be achieved faster if economic conditions improved, especially at the higher levels of education.

JEL Classification: H52 (Government Expenditures and Education), I21 (Analysis of Education), O12 (Microeconomic Analyses of Economic Development).

[1] Background paper elaborated in support of the UNDP/UN-DESA/World Bank project "Realizing the Millennium Development Goals through socially-inclusive macroeconomic policies". The views and opinions expressed here are those of the authors and do not necessarily reflect those of the institutions with which they are affiliated.

1. Introduction

By signing the United Nations Millennium Declaration in 2000, leaders from all countries agreed to pursue the Millennium Development Goals (MDGs) and to reach them by 2015 with a view to securing a world with less poverty, hunger and disease, with better-educated children, more gender equality, greater survival prospects for infants and mothers, and a healthier environment. With just little more than five years to the time horizon there are some signs of progress, though the challenges ahead are still staggering.

Achieving universal primary education (MDG 2) is of particular importance as this would affect enrolment in the subsequent education cycles and the participation in the labour market. In the longer run, it would be expected to impact positively on factor productivity and hence on wages and growth.

Most developing countries are edging closer to providing every child with primary school education, but they need to achieve faster progress to meet the 2015 target, especially in reducing the number of out-of-school children (United Nations, 2009). In these countries, enrolment coverage in primary education reached 88 per cent in 2007, up from 83 per cent in 2000. The Arab region as a whole fits pretty well in the progress profile of developing countries with an primary net enrolment rate of nearly 82 percent in the mid of the 2000s decade, up from around 72 percent in the early 1990s (United Nations and League of Arab States, 2007). In spite of remarkable progress, the primary net enrolment rate unmasks a different situation for the Arab LDCs (that is, Mauritania, Somalia, Sudan and Yemen) and this ratio was only almost 55 percent in 2004/2005 (Ibid.).

Yemen is among the poorest Arab countries. By the mid of the 2000s, GDP per capita was below $860 in Yemen where, furthermore, little more than 17 percent of the population lived with less than a dollar per day. During the first half of the past decade, annual average GDP growth per capita was around 0.5 percent having been little more than 2 percent during 1990-2000. The United Nations MDG indicators[2] show that Yemen's net enrolment ratio in primary education climbed to 75.4 percent in 2005, up from less than 50 percent in the early-1990s. In spite of this progress, enrolment coverage

[2] For more details, see: http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=589&crid=887

in primary education remains well below what it is in the developing world as a whole and is just above what the Arab region as a whole achieved in the early-1990s. Not only are low income per capita, high poverty and a relatively low primary net enrolment rate overwhelming challenges to reach MDG 2 by 2015 but also gender disparities are striking at all educational levels. Furthermore, basic education—which is the first educational cycle in the Yemeni context—comprises 9 grades, making it more unlikely that MDG 2 can be achieved timely. Against this backdrop, Government interventions need to be identified as soon as possible in Yemen in order to increase the demand for schooling and, by so doing, improve the prospects to achieve MDG 2. This paper shows that Government interventions should be aimed at raising female enrolment so as to reduce gender disparities in education—which is part of MDG 3—and create a synergy in favour of MDG 2.

The demand for schooling in primary and other levels of education is a function of student behaviour, starting with enrolment but also including graduation, repetition, and drop-out. Student behaviour, in turn, depends on individual-, household- and policy-based determinants such as, for example, sex, health status, income incentives, household income per capita, quality of education, and the level of public infrastructure, among many others.

Existing literature providing empirical evidence on these determinants of student behaviour is insufficient for Yemen. To our knowledge, only Al-Qudsi (2003) and Keiichi (2004) have made an attempt to analyse Yemeni education data in detail. Al-Qudsi applied a probit analysis using a dataset for 1994. The study of Keiichi develops no econometric analysis though it provides and interesting descriptive statistics based on data collected up until 2001. Some of the key challenges to achieving universal primary education in the Arab region have, however, been identified in *The Millennium Development Goals in the Arab Region 2007: A Youth Lens*, a report produced through a collaborative effort of United Nations agencies in the Arab region and the League of Arab States. Through reviewing current trends and progress in attaining the MDGs in the Arab countries at the regional and sub-regional levels, the report identifies key challenges such as: poor management skills in public schools; a lack of qualified teachers, particularly a shortage in female teachers in rural areas, which translates into lower

enrolment rates for girls; a lack of a proper incentive system, especially for parents from low-income households where the compounded effect of poverty and of a perceived low rate of return to education renders the opportunity cost of sending a child to school high; low quality of the curriculum; security issues in the conflict countries; and the fact that teachers and students cannot reach school due to destroyed infrastructure and other barriers to freedom of movement.

This paper's objective is to contribute to this literature by describing and analyzing empirical results of econometric estimations of enrolment behaviour in Yemen's public education system[3] in order to respond to what policy interventions would more effectively enable progress towards MDG 2. The paper further demonstrates that the effectiveness of policy interventions would depend on reducing the gender gap in education. The empirical analysis helps identify what are the key challenges spelled out in the United Nations-Leage of Arab States regional report that would matter most to facilitate progress in attaining MDG 2 in the particular context of Yemen.

Our econometric estimations covered the three cycles of the Yemeni public schooling system, although results are only reported and analyzed for the first two cycles for which a country such as Yemen could more realistically set up goals for the short- to medium-term. The first educational cycle, or "basic education", is comprised of 9 years or grades of schooling, of which the first six match the most conventional definition of primary education whereas the other three cover vocational education. Students are expected to enrol in this first cycle at the age of 6, in order to complete it when they are 14. The second educational cycle is high school and requires three years of schooling for completion before the student joins the higher cycle. The latter is university for which most faculties require 4 years of study before the student is granted a diploma[4].

The micro dataset used to carry out our econometric estimations is the Household Budget Survey for 2005/2006, which was conducted by the Central Statistical Organization of the Ministry of Planning and International Cooperation of the Republic of Yemen. This survey takes very detailed stock of boys and girls that had attended school and of the educational level that they had achieved during the survey reference

[3] In terms of number of enrolled students, the public schooling system represents 97 percent of the whole schooling system, according to Yemen's Household Budget Survey for 2005/2006.
[4] The empirical results for the third cycle are available upon request to the authors.

period. It is also very informative of why boys and girls did not attend school during the survey reference period, which helped us unfold interesting aspects of enrolment behaviour in Yemen[5].

The remainder of the paper is structured in four more sections. Section 2 starts with a review of literature on the main determinants of enrolment behaviour. Before presenting the econometric specification and analysing the empirical results in section 4, some summary statistics that help understand the profile of enrolled individuals in each of the three cycles of Yemen's public education system are analysed in section 3. Lastly, section 5 summarizes the conclusions of the paper and presents some policy recommendations.

2. Determinants of enrolment behaviour: what do we know?

It is generally accepted that education constitutes the main means by which a country invests in human capital and that the main gain of this investment is a higher living standard for a more literate population and more development for the country. Unsurprisingly, therefore, many developing countries still experience low levels of education attainment. For these countries, in particular, it then becomes relevant to investigate what are the main determinants of enrolment behaviour, with a view to assist policy makers in designing policies that may lead to increased educational attainment. The literature that focuses on this issue is vast so it is not straightforward to come to grips with a consensual theoretical and empirical view. In this section, we review some of the most important issues addressed by the existing literature.

Schultz (1999) identifies three key socioeconomic determinants of household demand for schooling: public expenditure on education, education of the parents, and wealth of the family.

Public expenditure on education is obviously of fundamental relevance to increase the enrolment rate ratio, especially for countries where the level of school and other public infrastructure is deficient, and this is well emphasized in the literature. Duflo

[5] Unfortunately, the survey does not take into account whether or not the student passed (or failed) the immediate past grade in which he/she was enrolled or whether the student is repeating the grade of current enrolment during the survey reference period such that student behaviour in latitudes other than enrolment cannot be analyzed.

(2001), for example, focuses on the case of Indonesia where a massive school construction programme was implemented by the national government during the 1970s. She noted that, as a result of the programme, the enrolment rate went to 83 percent in 1978 up from 69 percent in 1973. Furthermore, the years of education for enrolled students and wages were also observed to increase in the same period. Glewwe and Ilias (1996) noted that the economic decline of the late 1970s and early 1980s in Ghana led to a reduction in public spending in education and, as a consequence, enrolment rates were shown to be on the decline. The importance of public expenditure in education has also been highlighted by Handa (2002) who shows that building more schools in Mozambique has a larger impact on primary school enrolment rates compared with public interventions that raise household income. Similar results are also found in Handa and Simler (2005) for the same country. School building campaigns have also been proven effective to foster school enrolment in Egypt in the 1990s, as observed by Ahlburg et al. (2004). There is little evidence indicating otherwise. Al-Samarrai (2006), for example, argues that the link between educational access (and performance) and public education expenditure is weak, but this is not because such expenditure is unnecessary but because this is usually scaled up insufficiently.

Another stream of literature focuses on the quality of education. The main discussion started in Hanushek (1986). The author used a dataset for the United States to claim that school quality factors such as class size or level of infrastructure do not really have an impact on student behaviour and that the latter is more effectively influenced by the skills of the teacher. Hanushek's paper has been strongly criticized by subsequent contributors to this debate. Krueger (1999), for example, has offered strong evidence for the United States that students in small classes score much higher than students attending in regularly-sized classes. Angrist and Lavy (1999) similarly find that the size of the class is a crucial determinant of pupil's performance in Israel. Using a dataset for South Africa during the apartheid, Case and Deaton (1999) found a strong and significant effect of the pupil/teacher ratio on enrolment and educational achievement, especially among black children belonging to poorer families. The pupil/teacher ratio has also been found to be a significant determinant of educational achievement in Latin American countries. For example, Vos and Ponce (2004) and Hammill (2006) offer evidence of this for Ecuador

and Nicaragua, respectively. More recently, Hanushek et al. (2008) have shown that the quality of schools does influence enrolment and drop out in Egypt's primary education.

Parental education is unquestionably a fundamental factor in explaining education, especially in developing countries. An educated parent most likely understands more the importance of achieving basic education and would be more willing to send the offspring to school than a parent with none or little education. Educated parents are more prepared to evaluate the investment in human capital that would increase the wage expectations for their children. On the contrary, a parent that started to work at an early age and did not study as a consequence may not see school as a crucial investment. Wahba (2006) has for example found that, on average, 10 percent of a sample of Egyptian parents who were child labourers would most likely send their children to work rather than to school. To this some other evidence can be added. Tansel (2000) for Turkey and Al-Qudsi (2003) for the cases of Kuwait, Jordan, Gaza, and Yemen, for instance, coincide in that parental education and income are the most important determinants of education. Roushdy and Namora (2007) also provide evidence on the importance of parents' educational level for enrolment and drop out in Egypt's primary education.

Low levels of education in developing countries are generally associated with high levels of child labour. Very poor families with children at schooling age cannot afford foregoing the income that these children may bring home if they participate in the labour market and use other sources of income to invest in their education. For these families, education (as well as leisure) may be considered a "luxury" good as shown by Basu and Van (1998). Moreover, these authors show that a ban on child labour may even reduce welfare for a poor family when poverty is the main cause of child labour. For India, Jayachandran (2002) finds that poverty is among the key factors that explain why parents cannot afford sending their children to school. Unsurprisingly, then, evidence for Egypt suggests that family wealth has a strong positive effect on education attainment (Roushdy and Namora, 2007) and that expenditure per capita as a proxy of income has a positive and significant impact on child enrolment (Dancer and Rammohan, 2007). The empirical analysis of Psacharopoulos (1997) suggests that labour force participation of individuals under the legal working age or who are supposed to be in school reduces educational attainment in Bolivia and Venezuela. On the contrary, Ravallion and Wodon

(2000) question that child labour displaces schooling for the case of Bangladesh. They have found that a reduction in child labour only leads to a very small increase in school enrolment. Another contribution that tests and rejects the "luxury axiom" is provided by Ray (2000), in the context of Pakistan. Also, Bhalotra (2007) does not find a consistent relationship between child labour and household income.

Despite these conflicting views and evidence, poverty by and large remains one of the possible explanations for low attendance in developing countries' schooling system.

The study by Tansel (2000) further points to gender as one dimension that should not be neglected when analyzing the determinants of education. He noted that the effect of income on the schooling of girls was more marked than that of boys. In addition, the parental education effect on schooling was seen to be larger for girls. The gender issue is also raised by Ahlburg et al. (2004) in the context of Egypt's education. These authors note that the enrolment rate of rural girls aged 6-14 was only 72 percent of that of rural boys in 1988. Al-Samarrai and Peasgood (1998) find that household characteristics such as parental education may have a totally different impact on the education of females and males in Tanzania. Recent empirical evidence for Egypt emphasizes the gender issue, too. For example, Roushdy and Namora (2007) and Rammohan and Dancer (2008) show that boys are more likely to get more education than girls, and Hanushek el al. (2008) note that girls' drop out rate is 0.06 higher than boys' in elementary schools.

Another interesting issue discussed in the empirical literature on enrolment behaviour in developing countries is the delay in school enrolment which may be due to different reasons, some of which have already been discussed above. For example, Jacoby (1994) shows that Peruvians' entry into school may be delayed due to liquidity constraints faced by the household. In other words, Peruvian children at entry age may need to work first in order to save sufficiently and be able to pay for their own schooling expenses later on. For Glewwe and Jacoby (1994) malnutrition is seen as the main factor driving late enrolment in Ghana as this reduces the child's ability to learn and thus the likelihood of high returns to schooling. But late entry into the school system might also be correlated with the rationing of the supply of schools, according to the study of Bommier and Lambert (2000). Furthermore, children who do not live near a school may not be considered mature enough to walk to school on their own. Also, late entry into

school may also be the result of a portfolio choice in the household, as suggested by De Vreyer et al. (1998). As will be shown further on in our empirical analysis, some of the determinants of enrolment behaviour discussed in this section prove to be important in the context of Yemen.

3. Public education in Yemen[6]

Basic education

As indicated earlier, the second goal of the MDG agenda pursuits the achievement of universal primary education by 2015. Yemen's progress towards this goal can be evaluated through the rate of enrolment in basic education which is the first educational cycle in the context of Yemen´s education system. The fact that this cycle is comprised of 9 grades puts Yemen in a difficult position to achieve MDG 2 on time.

Using the survey dataset we find that, despite progress shown, Yemen is off track to achieve the primary education goal as only 66 percent of individuals pertaining to the relevant age cohort (that is, from 6 to 14 years of age) attended basic education in 2005/2006. This number is surprisingly low considering that basic education is compulsory in Yemen. The completion rate is even expected to be much lower. Unfortunately, repetition rates are not available in the survey dataset to calculate the completion rate, but it is possible to observe that drop-out rates are relatively large for some ages of the cohort.

The summary statistics presented in Table 1 help to establish a profile for enrolled Yemenis in basic education pertaining to the relevant age cohort which amounts to 22,973 individuals aged 6 to 14 in the 2005/2006 survey. Individuals of this cohort who were effectively enrolled did not turn out to be well distributed by sex. More than 80 percent of the males in the cohort (that is, 42 out of 52 percent) attended basic school whereas this share drops to about 60 percent for females. The majority of students had educated parents such that their household's per-capita income was on average 1,107 Riyals higher than that of the households of individuals that did not attend basic school.

[6] As indicated in the introduction, public education in Yemen accounted for 97 percent of the number of enrolled students in the Yemeni education system in 2005/2006. Private education is negligible in this country as measured by the number of enrolled students.

For the enrolled students, the number of educated heads outnumbers that of educated spouses. Almost 80 percent of the cohort expected to be enrolled in basic education lived in the rural area. Not only is this an indication of the demographical concentration of Yemen by area, but it further suggests that achieving MDG 2 would fundamentally demand making relatively more progress in rural area's education. More than 85 percent (20 out of 23 percent) of urban boys and girls pertaining to the cohort attended school compared to only 66 percent for boys and girls living in the rural areas.

Table 1. Characteristics of individuals pertaining to the relevant age cohort for basic education by enrolment status

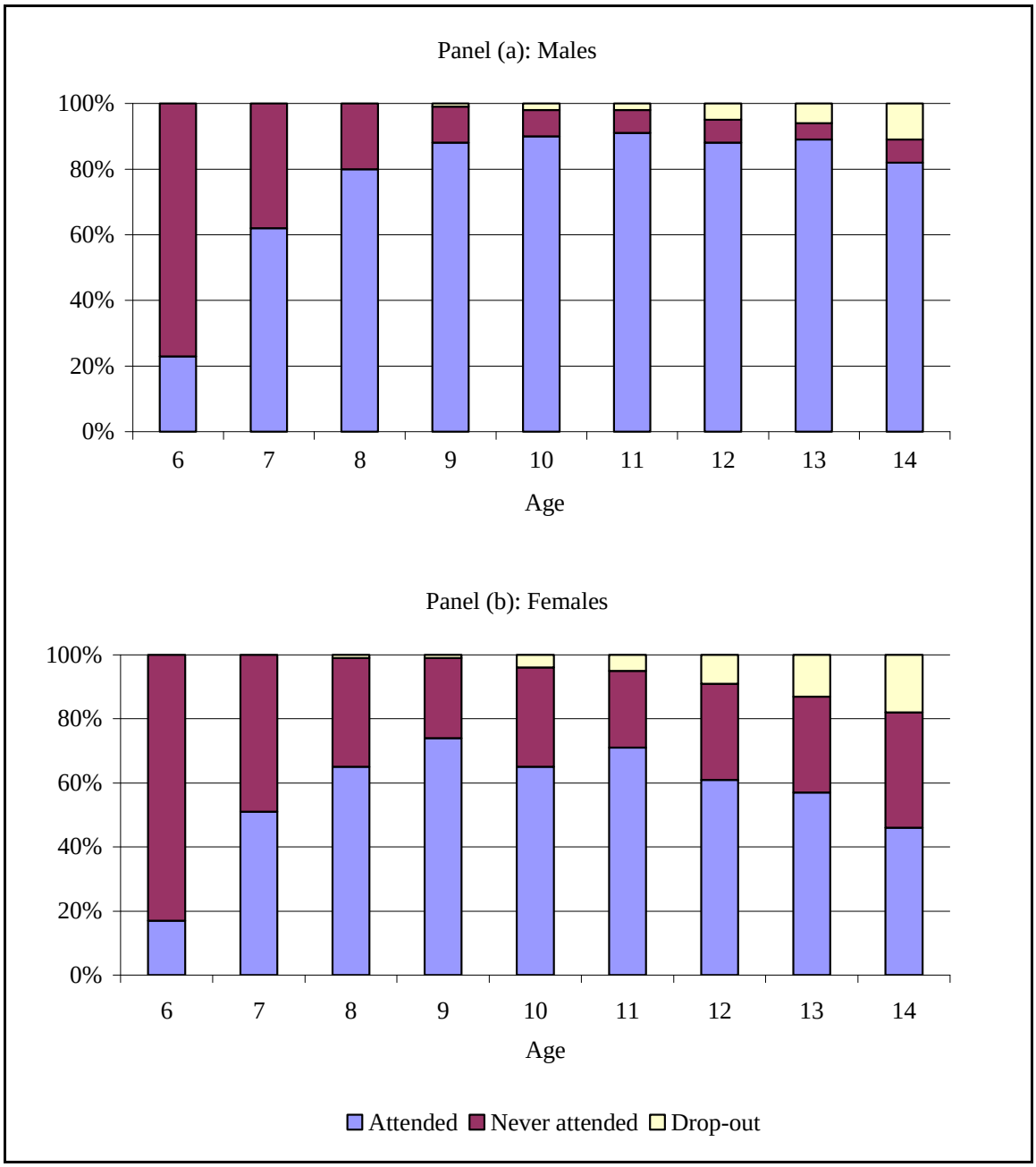
	Enrolled (a)	Not enrolled (b)	Total (a + b)
Male (percent in cohort)	43	9	52
Female (percent in cohort)	29	19	48
Educated head (percent in cohort) [1/]	33	8	41
Educated spouse (percent in cohort) [1/]	12	1	13
Rural area (percent in cohort)	51	26	77
Urban area (percent in cohort)	20	3	23
Average per-capita household income (Rials)	2,515	1,408	2,215

Source: Authors' estimates based on data from the Household Budget Survey for 2005/2006.
[1/] Household heads and spouses are assumed to be educated because they have attended school.

The MDG agenda also aims at eliminating gender inequalities in primary and secondary education, preferably by 2005, and for all levels of education before the end of 2015 (MDG 3, target 4). Yemen faces another challenge in this respect, as the ratio of girls to boys attending basic education is only 0.67. That is, for every two girls enrolled in basic school there are three boys enrolled. This disparity had already come clear in the evidence above that indicates that males enrolled in basic education outnumber the females. The gender gap in basic education widens as students turn 10 years old, fundamentally because girls tend to drop out proportionally more than boys and a large percentage of them never attend basic school (see Figure 1). In this respect Yemen scores bad compared to the average for the Arab LDCs where the number of girls enrolled in primary education for every 100 boys increased from 27 in 1991 to 81 in 2005 (United Nations and League of Arab States, 2007).

The drop-out rate is negligible before girls and boys turn 11 and 12, respectively, but this reaches 19 and 11 percent at the age of 14. Again, this evidence is indicative of the relative less success of girls relative to boys in completing basic education. Moreover, it is even more striking to observe that a larger share of boys and girls never attended basic school and, again, this is especially true for females (see Figure 1). In the cohort from 7 to 14 years of age, for example, on average 33 percent of the girls never attended school and this is a percentage than more than triples that of males. Individuals aged 6 were deliberately excluded from this computation because the percentage of them that never attended basic school is overwhelmingly higher than that of subsequent ages.

Figure 1. Distribution of individuals that attended, never attended or dropped out from basic education in 2005/2006 by sex and age



Source: Authors' construction based on data from the Household Budget Survey for 2005/2006.

The decision not to enrol seems to be associated with cultural factors and gender. The survey data indicates that 81 percent of parents of children aged 6 who did not attend school considered their sons were "too young" to enrol in the schooling system. This phenomenon is even observed at ages other than that of entry—for example, about 50 and

20 percent of the children aged 7 and 8 who did not attend school, respectively, were considered as "too young" to attend school. Figure 1 above suggests that the lack of attendance at the first ages is a fundamental problem. Our empirical analysis below suggests that a lack of education and other public infrastructure, which extends the time and the distance to travel to school, do affect enrolment at the entry age, particularly for females. Similar results are presented in Bommier and Lambert (2000) who found that Tanzanian boys leaving far form school may be considered young to walk to school alone, although these authors do not offer similar findings for girls.

Unfortunately, the lack of attendance at the early ages is associated with gender since the majority of individuals not attending basic school are girls (see Table 1 and also compare the two panels of Figure 1). Presumably, parents would not want to send their daughters to school because they have to play a role at home or they would feel their daughters are safer by keeping them at home rather than by allowing them to travel to and attend school. In either case, these parents are not seeing the education of their daughters as a real human-capital investment for the future. The high degree of poverty and the lack of economic opportunities may also discourage them to send their offspring to school—as some of our estimations below also suggest. These are all gender-, cultural-, and economic-related factors of fundamental importance since, by postponing entry into basic education, particularly for females, they are actually altering the normal course of the entire education process in Yemen and putting at stake the achievement of MDGs 2 and 3. Notable progress would also need to be made in terms of reaching target 4 of MDG 3, as huge gender disparities are still observed in Yemen's basic education system.

Some of the problems underlined above aggravate because enrolled students start to fail making progress as they become older. Students from grades 1 to 2 "succeed" because the law mandates to do so since the mid-1990s, as it has already been noted by Keiichi (2004). From Table 2 one can see that the proportion of students progressing regularly is already below 90 percent at the age of 10, and it levels off at about 66 percent at the age of 15—considering here students that due to late entry did attend basic education instead of starting the first grade of high school. Males also score better than females in terms of progress in basic school, and this thus poses more challenges to reduce gender disparities in that cycle.

Table 2. Proportion of students progressing regularly in basic school by age and sex (*Percentage*)

	Age								
	7	8	9	10	11	12	13	14	15 [1/]
Female	100	100	92	82	82	70	69	70	67
Male	100	100	95	87	83	77	77	74	66
Total	100	100	94	85	82	74	74	73	66

Source: Authors' construction based on data from the Household Budget Survey for 2005/2006.
[1/] This age group includes students that due to late entry attended basic education at the age at which they were supposed to start high school.

High school and university

Yemeni boys and girls are expected to be enrolled in high school at the ages of 15 to 17 or 18 for students that started basic education when they were 7. The survey accounts for 10,800 individuals in this age cohort of which only 21 percent attended high school, whereas 24 percent were still attending basic school and the remaining 55 percent did not attend school at all or dropped out. The drop-out rate was about 30 percent for this cohort.

Late entry is also observed for the secondary cycle. Only 53 percent of the individuals aged 15 or 16 attended (basic or high) school and 24 percent of the individuals at this age dropped out when they attended basic school—and the remaining 23 percent never attended school. Among individuals aged 15 or 16 that attended school, only 29 percent were enrolled in the first grade of high school.

Low enrolment, high drop-out rates, and late entry in high school are a reflection—if not an indirect result—of the cultural and socio-economic issues that also result in low enrolment and high drop-out rates seen for basic education. These are all problems that would also make it very challenging for Yemen to achieve goals for high school education.

Our descriptive statistics here and the econometric analysis further on for high school exclude the 24 percent of individuals aged 15 to 18 who attended basic school. As a consequence, the relevant cohort for high school that we use only includes 7,879 individuals. Table 3 below provides some summary statistics for this sample of which only 2,238 individuals (that is, 28 percent) attended high school, mostly in the rural areas. Nearly 43 percent of these individuals had an educated head (that is, 12/ (19+9)) compared with only 26 percent for individuals that did not enrol in high school.

Unsurprisingly, then, the family of a high school student on average earned about 1,126 Rials per capita more than the family of an individual not being enrolled in high school.

Gender disparities are also observed for high school, meaning essentially they are an inherent characteristic of Yemen´ school system. Focusing on Table 3, it is remarkable to note the high percentage of females not being enrolled in high school. Furthermore, for every two males enrolled in high school, there was only a female enrolled in the cycle such that the girl-to-boy ratio was only 0.48. All of this is clear evidence that high school education is even less equal than basic education in terms of enrolment by gender.

Table 3. Characteristics of individuals pertaining to the relevant age cohort for high school by enrolment status [1/]

	Enrolled (a)	Not enrolled (b)	Total (a + b)
Male (percent in cohort)	19	25	44
Female (percent in cohort)	9	47	56
Educated head (percent in cohort) [2/]	12	19	31
Educated spouse (percent in cohort) [2/]	5	4	9
Rural area (percent in cohort)	16	59	75
Urban area (percent in cohort)	11	14	25
Average per-capita household income (Rials)	3,085	1,959	2,272

Source: Authors' estimates based on data from the Household Budget Survey for 2005/2006.
[1/] The sample excludes individuals pertaining to the age cohort for high school that during the survey reference period attended basic school.
[2/] Household heads and spouses are assumed to be educated if they have attended school.

Interestingly, 40 percent of the parents of individuals aged 15 to 18 who did not attend high school claimed that the family was not interested in school. Of this share, about 85 percent of the non-attending individuals were girls. Only 6 percent of the parents of individuals that did not attend school surprisingly claimed that work was the reason for their son not to attend school. This hints at the hypothesis that, if a large number of families are not interested in the school of their youngsters—who are mostly females—and only a minority of these work and do not attend school, an overwhelming number of girls aged 15 to 18 just stay at home to help with the house keeping either of their parents´ house or of their own house in the event they got married when they were still young.

Lack of achievement and gender disparities are even more worrisome at the university level, but this is unsurprising if one considers that past failures seen in basic education and high school would most likely translate into meagre achievement at the highest school level. Students are supposed to start attending university at the age of 18 or 19 in order to obtain a diploma at the age of 22 or 23. For this age cohort there is a sample of 13,474 individuals of which only a staggeringly low 5 percent went to university. Little more than 12 percent of the individuals in this age cohort attended high school, and even 3 percent were still attending basic school. Of the remaining individuals, a share of 50 percent abandoned school and 29 percent never enrolled in the school system. Among those who never attended school, 88 percent are females.

Table 4 corroborates what has been observed for basic education and high school in the sense that a student enrolled in university most likely is a male and the family of this on average earns more than that of an individual of the same age cohort who did not go to university. The low enrolment rate, however, makes it more difficult to draw a line by geographical area. Past failure no doubt translates into a notable lack of enrolment in tertiary studies, but the wellbeing of the family weighs much more for an individual to make it all the way to university, compared with individuals that are enrolled in any of the previous cycles. Notice that the percentage of individuals living with educated parents is not lower for those who did not attend university (see Table 4), which is not observed for the two previous cycles. Even so, individuals enrolled in university tend to live in a household whose income per capita was 1,729 Rials above that of the household of a non-enrolled individual. For high school and basic education, this gap was equivalent to 1,126 and 1,107 Rials, respectively. In absolute terms, furthermore, the per-capita income of the household of an individual that attended university was fairly high (4,443 Rials) compared to that of and individual that was enrolled in high school or basic education (2,721 and 2,335, respectively). This suggests that only the higher income families can afford sending their youngsters to university in the case of Yemen—regardless of the education of the parents. This evidence as well as that that was provided for the previous cycles is further substantiated by the empirical results of the next section.

Table 4. Characteristics of individuals pertaining to the relevant age cohort for university by enrolment status [1/]

	Enrolled (a)	Not enrolled (b)	Total (a + b)
Male (percent in cohort)	4	40	44
Female (percent in cohort)	2	54	56
Educated head (percent in cohort) [2/]	3	34	37
Educated spouse (percent in cohort) [2/]	1	11	12
Rural area (percent in cohort)	3	68	71
Urban area (percent in cohort)	3	26	29
Average per-capita household income (Rials)	4,443	2,714	2,823

Source: Authors' estimates based on data from the Household Budget Survey for 2005/2006.
[1/] The sample excludes individuals pertaining to the age cohort for university studies that during the survey reference period attended any of the preceding cycles of education.
[2/] Household heads and spouses are assumed to be educated if they have attended school.

4. Econometric specification and empirical results

This section focuses on the determinants of enrolment behaviour as estimated for Yemen using the Household Budget Survey for 2005/2006. Our choice of the estimable specification is based on the main findings of the above-discussed literature and it also follows the specification of the MAMS model for student behaviour. The latter includes determinants of student behaviour such as the quality of education (identified by education spending per student), income incentives (the expected wage premium from education), the under-five mortality rate (a proxy for the health status of the potential student population), household consumption per capita (a proxy for the capacity to pay for education and for opportunity costs), and the level of public infrastructure (a proxy for the effective distance to school). Student behaviour is defined for entry and graduation rates in the three cycles of the educational system. The survey dataset allowed us to estimate student behaviour by cycle only for entry (or enrolling for the first time) and enrolment rates since the survey dataset lacks detail on students passing, failing or repeating. Even so, the empirical results can provide a good reference point to assign initial elasticity values to the MAMS model, as indicated further below.

We model the attendance event, assuming that decisions within the household are taken by a representative agent who wishes to maximize family welfare.

Therefore, the utility associated with both the decision to attend or not to attend the child in primary school is assumed to be a linear function of a set of household's socio-economic characteristics (X_i), and of a stochastic term which represents unobservable and measurement errors (ε_i). Given that the dependent variable is binary, the empirical equation for the attendance decision is:

$$\Pr(Y_{i,A} = 1) = \Phi[X_i \beta] \tag{3}$$

Against the non-attendance decision decision that is:

$$\Pr(Y_{i,A} = 0) = 1 - \Phi[X_i \beta] \tag{4}$$

Therefore, we can empirically analyze household determinants of enrollment and attendance behavior through the estimation of β parameters in the empirical equations (3) and (4). Probit regressions for enrolment behaviour in Yemen's public education system were run using the specification presented below. Enrolment behaviour accounts for the factors that, given the relevant age cohorts for each cycle[7], do affect the probability of enrolling in each cycle for the first time (that is, attending the first grade of the cycle) and the probability of attending school for all the grades in each cycle (that is, for the cycle as a whole).[8] In other words, six different behavioural equations for enrolment in the entire public education system of Yemen were estimated. The following initial specification was used for the six cases, which includes the expected signs for the coefficients of the explanatory variables or determinants:

$$\Pr(Attendance = 1) = \Phi(\alpha + \beta_0 Area + \beta_1 Sex + \beta_2 Head\_edu + \beta_3 Spouse\_edu + \beta_4 Health + \beta_5 Inc\_pc + \beta_6 Access\_\inf + \beta_7 Access\_school)$$

[7] Some exceptions are made in respect to the "theoretical" age cohorts of each cycle as discussed further below.

[8] Estimating enrolment behaviour for individuals enrolling in high school and university for the first time is equivalent to measuring student behaviour for those that, respectively, graduated from the last grade of basic school and high school. This clarification is relevant to understand how our estimations can be used to feed up MAMS with education behaviour elasticities as estimated in this paper.

where,

y: dependent variable that takes a value of 1 if the individual—of the relevant age cohort for the cycle—attended school at the time when the survey was conducted, or 0 otherwise.

Area: variable denoting whether the individual lives in the urban (1) or in the rural (0) areas.

Head_edu: variable being equal to 1 if the head of the household—of which the individual studied is part—attended school, or 0 otherwise.

Spouse_edu: variable corresponding to 1 if the spouse of the head of the household—of which the individual studied is part—attended school, or 0 otherwise.

Health: variable defining if the student suffers from any disability or chronic illness for which 1 is given, or 0 otherwise—a proxy for the health status of the potential student population.

Sex: defines if the individual is a male (1) or a female (0).

Inc_pc: income per capita.[9]

Inf: accounts for the level of public infrastructure, taking the following values: 0, if the individual is not enrolled because it is too difficult to travel to school (meaning there are no roads or the distance to school is too long) and the household is not provided with electricity supply from a public network; 1, if just one of the previous sources of public infrastructure is available; and 2, if the two sources of public infrastructure are available.[10]

[9] This is a proxy for the household consumption per capita variable used in MAMS. We used the following linear transformation for the logarithm of the household income per capita of each individual (y_i):

$$\frac{y_i - y^{min}}{y^{\max} - y^{min}}$$

where, y^{min} and y^{max} are, respectively, the minimum and maximum logarithm of incomes observed in the sample. This transformation allows the logarithm of household income per capita to range between 0 and 1, which are the two extreme values that the binary dependent variable can take. This is a transformation that does not affect in any way the original household income distribution.

[10] This is a proxy for "other public infrastructure" in MAMS, which essentially accounts for all other public infrastructure not pertaining to the MDG-related sectors (that is, education, health, and water and sanitation). More often than not this includes electricity and transport (roads, bridges, airports, and so on).

Edu_qual: measures the quality of education by looking at the supply of schools and teachers by governorate.[11] It basically accounts for governorate-specific average proportions for individuals claiming they do not go to school because either there is no school or there is no teacher available.[12]

Our specification does, however, include a relatively small number of explanatory variables compared with other empirical studies. This choice is made deliberately in order for us to focus exclusively on the key determinants to enrolment behaviour and keep our specification not too overloaded with dummy variables that may invalidate the regressions results. All estimation results are provided below for samples of individuals of the following size: 10,933 in basic education, 3,851 in high school and 5,710 in university. Equations for both entry and attendance were estimated for the three cycles. The following estimation results are reported in the tables below: the value of the estimated parameter; the z-statistics in brackets; the marginal effects, which measure how much the probability of entering or attending a cycle would change as a result of a chance in the determinant.

Basic education

In the first step of the econometric analysis we start focusing on data at aggregate (national) level running regression as in Table A1. As shown in the empirical results the "sex" variable has a strong impact of the dependent variable. Unsurprisingly, due to the gender issue observed above, being a boy increases remarkably the probability of

[11] This is a proxy for real education services per student in MAMS

[12] This variable was set up as follows. First, the governorate-specific percentage of individuals claiming there is no school or teacher was created (that is, p_i, where subscript i represents each governorate). The percentage of individuals that are presumably "satisfied" with the availability of schools and teachers was subsequently computed as $g_i=(1-p_i)$, such that:

$$Edu\_qual_i = \frac{g_i - g^{min}}{g^{max} - g^{min}}$$

where, g^{min} and g^{max} represent the governorates with, respectively, the minimum and the maximum satisfaction values in regard to the availability of schools and teachers. Hence, the variable ranges between 0 (for the governorate with the higher percentage of people claiming there is a lack of school or teachers) and 1 (for the governorate with no people complaining about the availability of schools and teachers). In other words, *Edu_qual* essentially represents an indicator of satisfaction with respect to school infrastructure in each governorate and its meaning is fundamentally the same as that of the variable g_i to the extent that it is just a linear transformation of that variable.

attending school. Moreover, In addition, we run the Chow test to check this formally (see Table A1). The results of the tests for the different cycles clearly indicate the strong differences between sexes. Therefore, the empirical analysis was conducted running female and equations separately.

Table 5 reports the estimation results for the attendance equations for basic education by gender. Empirical results are impressive since the impact of each variable varies remarkably depending on gender. The first and most visible fact is the gap in the attendance with 82 percent of boys against only 60 percent of girls attending school.

[TABLE 1 ABOUT HERE]

The general belief that living in the urban areas increases the probability of being enrolled holds only for females attending basic school. On the contrary, male seem not to be affected by the area in which they live. This implies that the marginal effect observed in Table A1 at national level is mainly driven by female.

Parental education is also on the whole more important for girls to be enrolled in basic education. In fact, the education of the spouse, which in most cases is the mother, turns particularly important for females and not important at all for males. Also the education of the father variable has a marginal effect which is double that of male.

The quality of education turns out to be very important for girls. The same variable is also significant in male regression, although the impact is much smaller compared with female regression. A 1 percent increase in the quality of education would increase the probability of attending school of 25 percent for a girl and 15 percent for a boy. This result comes hand in hand with the fact that, among those individuals who claimed they were not enrolled in basic school because there were neither schools nor teachers available, 70 percent of them are females. As indicated earlier, the quality of education is measured here through the availability of schools and teachers. Presumably, then, a large percentage of girls claimed there was no school available because they are not able (or allowed) to travel some relatively long distance to school. Parents are most likely less willing to send their daughters to school if this would take them to walk a long distance or travel a long time by public transportation. It is unsurprisingly, then, that most

of the non-enrolled individuals are females and these mostly live in the rural areas (see Table 1).

Related to the above, also, is public infrastructure, the improvement of which could also help to reduce the distance and the time that a girl would have to spend in travelling to school. According to the empirical results, the probability for female of attending in basic education would be expected to increase remarkably as a result of an improvement in public infrastructure. The same holds also for male despite that the marginal effect is basically half of female. Therefore, more public investment in basic education and public infrastructure appears to be a crucial requirement for the Government of Yemen to increase the enrolment rate and make basic education a universally attainable service, especially for females.

Income per capita has the smallest impact (3 percent) with an elasticity of about 4 percent in the estimation at the national level. Again, although the low importance of income at aggregate level, the gap between marginal effects in the female and male regression is visible and nearly double. As a consequence, to be a member of a wealthy family will influence the decision to attend basic education for females more than for males.

The presence of a chronic illness or disability reduces the probability of entry and attendance by, respectively, 26 and 24 percent. It is worth noting that only 3 percent of the individuals aged to be enrolled in basic education suffered from a chronic illness or disability during the survey reference period. These results suggest that any policy targeting improvements in child health will increase the probability that more boys and girls enrol in basic education.

High school and university

Above basic education, schooling is quite problematic in Yemen. Table 6 shows that only 42 and 16 percent of male and female attended high school in 2005/06. This represents a serious obstacle to be removed if the country aims at progressing in development.

As already observed for basic education, living in the urban areas increases substantially the probability of being enrolled for females, for which the marginal effect is about 11 percent. On the contrary, the area of residence makes no difference for the enrolment of males, as it was also the case for basic education. This is presumably because both education quality and public infrastructure tend to be higher in the cities.

Furthermore, parental education has an important influence on attending high school for both sexes. Not in particular that the impacts of both spouse and father seem to be similar and relevant in both regressions. This is interesting especially for male since the same is not true for basic education. Therefore, high school attendance is fully supported by educated families.

What seems to be a problem of concern for both males and females to increase their attendance in high school is the lack of schools and teachers which can only be shrunk by scaling up public spending in education.

Good education quality would increase the probability of entry and attendance by little more than 20 and 17 percent for male and female. This is reasonable considering that 20 percent of the individuals that did not attend high school claimed there was no school or no teacher available. The marginal effects of public infrastructure are much less, but still close to 10 percent. Therefore, scaling up public spending to invest more in education and improve the public infrastructure network would favourably impact on enrolment in high school education in Yemen. From a cost-effectiveness point of view, however, the priority should be to spend more in building schools and hiring more teachers. This is different with respect to what we claim above for primary education as the number of learning centres and teachers in basic education is presumably larger than that in high school.

In an LDC like Yemen, the gender issue affecting enrolment in basic education and high school need to be urgently addressed if this country seriously intents to achieve the agreed MDGs in the area of education. This would most likely consequentially increase the number of potential students entering in university.

Estimation results for the university level are reported in Table 7. Here the attendance figures are really poor. Less then 10 and 5 percent of male and female attended University. The gender issue here is not so visible despite that males still outnumber female. The real problem here is that University is achievable only from small elite of people.

As for male, father education seems to be the only crucial variable affecting the attendance. Also increasing the level of infrastructure might positively affect male attendance. As of female, the area together with the quality of education turns out to be also crucial as seen above.

5. Conclusions and policy recommendations

In spite of observed progress, it is safe to argue that Yemen is off track to achieve universal primary education by 2015 (MDG 2). More than 30 percent of individuals pertaining to the age cohort for basic education were not enrolled in 2005/2006, which is surprisingly low considering that entry and attendance are compulsory. Completion on time in basic education is substantially lower owing to late entry, poor performance, and high drop-out rates. Furthermore, basic education in Yemen is a 9-grade cycle, so it would take up to the year 2018 to get all boys and girls of the relevant age to complete it on time, assuming they are all enrolled by 2010. Against this backdrop, Yemen's Government should perhaps set a less ambitious target for 2015; for example, ensure that all boys and girls complete the first five grades of education on time. There is ample scope for the Government to intervene and ensure that education goals are attained.

More than 70 percent of students in basic school live in the rural areas where, nonetheless, enrolment per student pertaining to the relevant cohort is relatively lower than in the urban areas. Faster progress towards MDG 2 will require major policy efforts to get more children enrolled in the rural areas—and, of course, to ensure they complete the cycle on time. But achievement of MDG 2 will also require a higher enrolment of girls and the elimination of gender disparities—that is, attaining MDG 3 for basic education. For every two girls enrolled in basic school there are three boys enrolled and the gender gap widens notably as students turn 10 years old. Girls drop out relatively

more than boys and the percentage of them that never attend basic school basically triples that of boys. This paper's empirical results indicate that the probability that an individual enters and attends basic school is, respectively, 12 and 22 percent higher for boys.

The decision not to enrol in basic school is associated with cultural factors and gender. Little more than 80 percent of the parents of children aged 6 who did not attend basic school in 2005/2006 considered their offspring was "too young" to enrol in the schooling system. This phenomenon is observed at ages other than that of entry and mostly affects girls. An important number of parents seem to be unwilling to send their daughters to school because they have to play a role at home or they feel their daughters would be safer by staying at home rather than travelling to and attending school.

Students also make less progress in school as they become older, especially females. Therefore, improving educational performance is also crucial to reduce gender disparities in education. Students also lose interest in education as they see little income incentive from getting educated. The expected wage premium from education was found not to have any significant influence on the student's decision to attend basic school.

Low enrolment, late entry, high drop-out rates, poor performance, and gender disparities are also present in the higher cycles of education. In high school, in particular, only 6 percent of the parents of individuals that did not attend school in 2005/2006 claimed that work was the reason for their boy or girl not to attend school. This is because an overwhelming number of the individuals staying at home are girls. In the case of university, past failure translates into a notable lack of enrolment, too, but the wellbeing of the family weighs much more for an individual to afford tertiary studies. As a consequence, only 5 percent of individuals at entry age do enrol in tertiary education.

With the majority of individuals not attending basic school living in the rural areas, development of rural public infrastructure becomes crucial to improve the prospects of achieving MDGs 2 and 3, and further experience better educational outcomes in high school. Improving the public infrastructure network to facilitate and reduce the time needed to travel to school would remarkably raise the probability of entry and attendance in basic education by, respectively, 33 and 22 percent—and by around 10 percent for entry and attendance in high school. This probability is found to be higher for females as parents would be more willing to send their daughters to school if improved

public infrastructure shortens considerably the distance and the time to travel to school. Spending in public infrastructure would be more cost-effective than spending more to build more schools and hire more teachers for basic education. The latter type of spending, nonetheless, could be particularly important for females whose probability of entry in basic school would increase by about 22 percent and it would also increase the probability of enrolment by a slightly lower percentage in high school where the deficit of teachers and teaching centres is more pronounced.

Scaling up public spending to improve children's health would make it more likely for boys and girls to enrol in basic education and progress to high school. We have found that a chronic illness or disability reduces the probability of entry and attendance in basic school by about 20 percent and by about half this percentage for attendance in high school.

In addition to spending, wealth is also important for Yemenis to be sent to basic school. This study finds that the higher the income per capita, the more the likelihood that a girl mainly, but also a boy to a lower extent, will attend basic school. As a consequence, not only will it be important for the Yemeni Government to ensure that economic growth remains high and sustained to make progress towards MDGs 2 and 3, but also that this growth trickles down to poor parents who otherwise could not send their children to school. Improved wellbeing of families and skilled workers would also help to increase the number of students that enter and stay enrolled in the higher levels of education, too, as these may be considered "luxury" goods in the Yemeni context, especially university.

References

Ahlburg, Dennis A., Ragui Assaad and Brian McCall (2004). "Educational attainment in Egypt: the impact of delayed entry to school". Unpublished manuscript.

Al-Qudsi S., Sulayman (2003). "Family background, school enrolments and wastage: evidence from Arab countries". *Economics of Education Review*, 22 (6): 567-80.

Al-Samarrai, Samer (2006). "Achieving education for all: how much does money matter?" *Journal of International Development*, 18 (2): 179-206.

Al-Samarrai, Samer, and Tessa Peasgood (1998). "Educational attainments and household characteristics in Tanzania". *Economics of Education Review*, 17 (4): 395-417.

Angrist, Joshua, and Victor Lavy (1999). "Using Maimonides' rule to estimate the effect of class size on scholastic achievement". *The Quarterly Journal of Economics*, CXIV, 533-75.

Basu, Kaushik, and Pham Hoang Van (1998). "The Economics of Child labor". *American Economic Review,* 88 (3): 412-27.

Bhalotra, Sonia (2001). "Is child work necessary?" The World Bank Social Protection Discussion Papers, No. 0121, Washington, D.C.

Bommier, Antoine, and Sylvie Lambert (2000). "Education demand and age at school enrolment in Tanzania". *Journal of Human Resources*, 35 (1): 177-203.

Case, Anne, and Angus Deaton (1999). "School quality and educational outcomes in South Africa". *Quarterly Journal of Economics*, 114 (3): 1047–84.

Dancer, Diane, and Anu Rammohan (2007). "Determinants of Schooling in Egypt: The Role of Gender and Rural/Urban Residence". *Oxford Development Studies*, 35(2): 171-95.

De Vreyer, Philippe, Lambert Sylvie, and Magnac Thierry (1998). "Educating children: a look at family behaviour in Cote d'Ivoire". Unpublished manuscript.

Duflo, Ester (2001). "Schooling and labor market consequences of school construction in Indonesia: evidence from an unusual policy experiment". *American Economic Review*, 91 (4): 795-813.

Glewwe, Paul, and Hanan Jacoby (1994). "Student achievement and schooling choice in low-income countries: evidence from Ghana". *Journal of Human Resources*, 29 (3): 843–64.

Glewwe, Paul, and Nauman Ilias (1996). "The determinants of school attainment in Sub-Saharan Africa: a case study of Ghana". *Journal of International Development*, 8: 395–413.

Hammill, Matthew (2006). "Determinants of selected MDGs in the framework of the MAMS model for Nicaragua". Background paper for the project *Public Policies for MDGs in Latin America and the Caribbean*, ECLAC Subregional Office in Mexico, United Nations.

Handa, Sudhanshu (2002). "Raising primary school enrolment in developing countries: the relative importance of supply and demand". *Journal of Development Economics*, 69: 103-28.

Handa, Sudhanshu, and Kenneth Simler (2005). "Quality or quantity? The supply-side determinants of primary schooling in a poor rural economy". *Journal of African Economies*, 15 (1): 59-90.

Hanushek, Eric (1986). "The economics of schooling: production and efficiency in public schools". *Journal of Economic Literature*, 24 (3): 1141-77.

Hanushek, Eric, Victor Lavy, and Hitomi Kohtaro (2008). "Do Students Care about School Quality? Determinants of Dropout Behavior in Developing Countries". *Journal of Human Capital*, 2(1): 69-105.

Jacoby, Hanan (1994). "Borrowing constraints and progress through school: evidence from Peru". *Review of Economics and Statistics*, 76 (1): 151–60.

Jayachandran, Usha (2002). "Socio-economic determinants of school attendance in India". Centre for Development Economics, Working Paper No. 103.

Keiichi, Ogawa (2004). "Achieving Education for All in Yemen: Assessment and Current Status". *Journal of International Cooperation Studies*, 12 (2): 69-89

Kruger, Alan (1999). "Experimental estimates of education production functions". *The Quarterly Journal of Economics*, CXIV, 497-532.

Lofgren, Hans, and Carolina Diaz-Bonilla (2009). "MAMS: An economy-wide model for analysis of MDG country strategies—an application to Latin America and the Caribbean". Forthcoming as chapter 3 in: *Public Policies for Human Development. Feasible Financing Strategies for Achieving the MDGs in Latin America and the Caribbean,* edited by Rob Vos, Enrique Ganuza, Hans Lofgren, Marco V. Sánchez and Carolina Díaz-Bonilla.

Patrinos, Harry, and George Psacharopoulos (1997). "Family size, schooling and child labor in Peru: an empirical analysis". *Journal of Population Economics*, 10 (4): 387-405.

Psacharopoulos, George (1997). "Child labor versus educational attainment: some evidence from Latin America". *Journal of Population Economics*, 10 (4): 377-86.

Rammohan, Anu, and Diane Dancer (2008). "Gender Differences in Intrahousehold Schooling Outcomes: The Role of Sibling Characteristics and Birth-Order Effects". *Education Economics*, 16 (2): 111-26.

Ravallion, Martin, and Quentin Wodon (2000). "Does child labor displace schooling? Evidence on behavioural responses to an enrolment subsidy". *The Economic Journal*, 110: C158-C175.

Ray, Ranjan (2000). **"**Analysis of child labor in Peru and Pakistan: a comparative study". *Journal of Population Economics*, 13 (1): 3-19.

Namoro, Sailiou, and Rania Roushdy (2008). "Intrahousehold Resource Allocation in Egypt: Women Empowerment and Investment in Children". Forthcoming in *Middle East Development Journal*.

Schultz, Paul (1999). "Health and schooling investments in Africa". *Journal of Economic Perspectives*, 13 (3): 67–88.

Tansel, Aysit (2003). "Determinants of school attainment of boys and girls in Turkey: individual, household and community factors". *Economics of Education Review*, 21 (5): 455-70.

United Nations (2009). *The Millennium Development Goal Report 2009,* New York: United Nations.

United Nations and League of Arab States (2007). The Millennium Development Goals in the Arab Region 2007: A Youth Lens, Beirut: United Nations Economic and Social Commission for Western Asia.

Vos, Rob, and Juan Ponce (2004). "Meeting the millennium development goal in education: a cost-effectiveness analysis for Ecuador". Institute of Social Studies, Working Paper Series, No. 402.

Wahba, Jackline (2006). "The influence of market wages and parental history on child labor and schooling in Egypt". *Journal of Population Economics*, 19 (1): 823-52.

Appendix 1: Estimation results using both sexes combined by cycle

Table A1. Estimated resu

	Basic education		Secondary education		Higher education	
	Parameter estimates	Marginal effects	Parameter estimates	Marginal effects	Parameter estimates	Marginal effects
Sex	0.743*** (18.98)	**0.233**	0.861*** (14.48)	**0.262**	1.242*** (9.78)	**.058**
Area	0.130*** (2.97)	**0.040**	0.213*** (3.04)	**0.067**	0.669*** (4.06)	**.032**
Head_edu	0.364*** (7.78)	**0.109**	0.391** (5.37)	**0.127**	0.558*** (3.68)	**.026**
Spouse_edu	0.333*** (4.12)	**0.094**	0.375*** (3.55)	**0.127**	0.288* (1.66)	**.013**
Edu_qual	0.646*** (9.45)	**0.203**	0.661*** (7.11)	**0.201**	0.769*** (3.36)	**.032**
Inc_pc	0.107*** (8.49)	**0.033**†	0.085*** (4.09)	**0.026**†	0.159*** (3.24)	**.006**†
Inf	0.591*** (12.44)	**0.177**	0.307*** (3.88)	**0.095**	0.463** (2.30)	**.020**
Health	-0.749*** (-5.52)	**-0.277**	-0.221 (-1.10)	-0.062	-.136 (-0.41)	**-.005**
Sample	10933		3851		5710	
Mean Y_i	0.713		0.274		0.067	
Chow test	F(8, 10888) =51.61 (0.00)		F(8, 3806) = 26.06 (0.000)		F(8, 5665) = 14.06 (0.000)	

[1/] The following notes apply to this and subsequent tables in this appendix: (i) z-statistics are presented in brackets; (ii) the statistical significance is at the 1, 5, or 10 percent level if, respectively, three, two, or one asterisks are added, or there is no statistical significance otherwise; † The marginal effects reported represent the value of the semi-elasticity. The elasticities are 0.044, 0.112 and 0.151, respectively for basic, secondary and higher education.

Table 5. Estimation results for attendance in basic education[1/]

	Male		Female	
	Parameter estimates	Marginal effects	Parameter estimates	Marginal effects
Area	-.059	-.014	.271***	**.099**
	(-.90)		(4.78)	
Head_edu	.349***	**.079**	.388***	**.143**
	(4.82)		(6.35)	
Spouse_edu	.122	.028	.464***	**.161**
	(1.06)		(4.47)	
Edu_ qual	.622***	**.149**	.679***	**.256**
	(6.35)		(7.01)	
Inc_pc	.099***	**.024**[†]	.112***	**.042**[†]
	(5.32)		(6.51)	
Inf	.525***	**.120**	.640***	**.234**
	(7.20)		(10.43)	
Health	-.799***	**-.258**	-.622***	**-.244**
	(-4.47)		(-3.32)	
Sample:	5652		5281	
Mean of Y_i	.818		.598	

The following notes apply to this and subsequent tables in this appendix: (i) z-statistics are presented in brackets; (ii) the statistical significance is at the 1, 5, or 10 percent level if, respectively, three, two, or one asterisks are added, or there is no statistical significance otherwise; [†] the marginal effects reported represent the value of the semi-elasticity. The elasticities are .067 and .028, respectively for female and male.

Table 6. Estimation results for attendance in high school education[1/]

	Male		Female	
	Parameter estimates	Marginal Effects	Parameter estimates	Marginal effects
Area	-.050	-.019	.497***	**.110**
	(-0.54)		(4.58)	
Head_edu	.440***	**.172**	.353***	**.075**
	(4.34)		(3.33)	
Spouse_edu	.419***	**.165**	.317**	**.071**
	(2.65)		(2.25)	
Edu_ qual	.573***	**.220**	.887***	**.169**
	(4.49)		(6.87)	
Inc_pc	.089***	**.034**	.075**	**.014**
	(3.22)		(2.29)	
Inf	.248**	**.095**	.419***	**.084**
	(2.34)		(3.35)	
Health	-.443*	-.156	.068	.013
	(-1.63)		(0.25)	
Sample:	1824		2027	
Mean of Y_i	.422		.158	

The following notes apply to this and subsequent tables in this appendix: (i) z-statistics are presented in brackets; (ii) the statistical significance is at the 1, 5, or 10 percent level if, respectively, three, two, or one asterisks are added, or there is no statistical significance otherwise; [†] the marginal effects reported represent the value of the semi-elasticity. The elasticities are 0.128 and 0.088, respectively for female and male.

Table 7.. Estimation results for attendance in University education[1/]

	Male		Female	
	Parameter estimates	Marginal effects	Parameter estimates	Marginal effects
Area	.166	.011	1.84***	**.039**
	(0.78)		(4.11)	
Head_edu	.934***	**.078**	.147	.002
	(4.72)		(0.53)	
Spouse_edu	.074	.005	.427*	**.006**
	(.30)		(1.69)	
Edu_ qual	.500	.033	1.31***	**.024**
	(1.70)		(2.61)	
Inc_pc	.116*	**.007**	.189*	.**002**
	(1.81)		(1.79)	
Inf	.508**	**.035**	.659	.009
	(2.02)		(1.22)	
Health	-.351	-.020	.201	.003
	(-.63)		(0.50)	
Sample:	2574		3065	
Mean of Y_i	.085		.034	

The following notes apply to this and subsequent tables in this appendix: (i) z-statistics are presented in brackets; (ii) the statistical significance is at the 1, 5, or 10 percent level if, respectively, three, two, or one asterisks are added, or there is no statistical significance otherwise; † the marginal effects reported represent the value of the semi-elasticity. The elasticities are 0.19 and 0.131, respectively for female and male.