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Gender Gap in Current School Enrolment in Cameroon: Selection Among "Irregular" Children?*

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Abstract

Many developing countries face a pro-male gender gap in schooling, as boys are more likely to be enrolled at school than girls. This paper examines whether the current enrolment gap prevails equally both among children with a "regular" and an "irregular" schooling history. Children with a Regular schooling history are those who completed primary education between the ages of 12 and 15 years. Children with an Irregular schooling history are the rest. We investigate the gender gap in schooling empirically using data provided by the 2001 Cameroon Household Survey. The empirical framework allows for a different gender effect among regular and irregular children. It also accounts for selection into the two groups. Results show no male-female difference among regular children. Among irregular children however, females are more likely to stay out of schools.

Our results suggest that, female children are given a schooling possibility to start with but are more exposed to dropping out if they display any form of irregularity in the course of their education.

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1 Introduction

It is widely recognized that, irrespective of gender, investments in education have positive effects on individual income and productivity. Unfortunately, in many developing countries, a pro-male gender gap is still observed in schooling (Orazem and King, 2008, World-Bank, 2008, Dar et al., 2002). Closing this gap is a priority for many governments[1] and is included in the Millennium Developments Goals.

The literature has suggested many sources of the gender gap in school enrolment: preference or parental discrimination (Kingdon, 2002), market incentives such as the male-female differences in the opportunity cost of time spent at school and the male-female difference in future earning prospects (Kingdon, 1998, Munshi and Rosenzweig, 2006), and social norms about gender roles in familial relationships (Orazem and King, 2008, Rosenzweig and Schultz, 1982, Lahiri and Self, 2007). The driving forces of the cited gender gap generate a similar gender effect across different groups of children. In particular, a similar gender effect is expected among children who started their educational process with a delay and those who did not, children who have repeated grades and those who have not. In this paper we investigate whether the gender gap in school enrolment is alike among children on one hand, who have experienced late enrolment or who have repeated grades and on the other hand, children with a regular course of study. Hereafter, we refer to the words "regular" and "irregular" to identify two groups of children. Regular children are those who completed primary education between the ages of 12 and 15 years. Irregular children are the rest, namely children who have not completed primary education by the age of 15. They have faced at least one of the following irregularities: delayed enrolment, repeating a grade, or interruption in the course of study.

We use data provided by the 2001 Cameroon Living Standards Measurement Survey (LSMS) and examine the gender gap in current school enrolment rates among children aged 12 to 19 years. We start at age 12 for two reasons: (1) in general primary education is completed around the age of 12, and (2) in our data, there is almost no male-female difference in school enrolment rates up to the age of 11[2]. Indeed, in our database 82% of children aged 6 to 11 years old are enrolled in school and this enrolment rate is split into 83% for boys and 81% for girls[3].

To refine the distinction between regular and irregular children, we take advantage of the fact that in Cameroon, a countrywide exam, called the Primary School Certificate (CEP), is administered at the end of primary school. This exam takes place on the same days with the same set of questions for all candidates. Children take this exam when they are around 12 years old. A child is considered regular if he or she passes the exam by the age of 12 or before the age of 15 [4]. Using this criterion, we divide children aged 12 to 15 years into two groups. Regular

[1]The reduction of the gender gap in education is an important priority in the Poverty Reduction Strategy Papers of most countries.

[2]We document this in the paper. We typically suppose that, the current wave of children aged 6 to 11 properly represents the situation of children aged 12 or more when they were younger (stationarity assumption). We then show that there is no male female difference before the age of 11.

[3]Furthermore, the net enrolment rate in primary school is 78%, with 79% for boys and 77 % for girls (INS and Macro, 2005).

[4]We choose 15 years as upper the limit to account for the fact that, around the age of 16, children attend

children or children with CEP and irregular children or children with no CEP.

As a robustness check, we do a similar analysis with an alternative group of children. The reference exam is now the secondary school certificate (BEPC) which is organized at the end of the 10^{th} year of education. Children take this exam when they are around 16. Gender difference in school enrolment is investigated among children aged 16 to 19, taking into account the distinction between those who hold a BEPC and those who do not.

Our empirical framework accounts explicitly for the fact that completing primary education (success in CEP) is not a purely random realization. It jointly estimates the probability of having the CEP and the probability of being currently enrolled in school. This approach has the advantage of controlling for the selection into groups of irregular and regular children. The main finding is that male-female difference in school enrolment is observed only among irregular children. This result suggests that female children are more penalized when they display some irregularities in their course of study.

From the data, it is not possible to identify the exact economic mechanism driving our empirical results. However, given our static analytical framework, the results seem to highlight the role played by the schooling history of a given child. Thus, current schooling decision may depend on past schooling decisions and past schooling outcomes. For instance, if from the schooling history, parents realize that their daughter has some schooling irregularities (e.g. repeating grades), they may anticipate that, additional investment in her education would not be properly rewarded. However, in the case of a boy, despite the irregularities, they can still expect good returns. Such gender difference in perceived return to education can be driven by the fact that, after the schooling period, females often get married and do housework (non income generating activities) while males males hardly do so.

The contribution of this paper is the light it sheds on the role played by children's schooling history on their probabilities of being currently enrolled in school. It suggests that, independently of the source of the gender difference, the pro-male gender gap in school enrolment seems to be important mainly among children who have had some schooling irregularities. Thus, reducing sources of schooling irregularities such as late enrolment and repeating grades should be added to the set of policies suggested by Glick (2008) to reduce the schooling gender gap.

The paper is organized as follows. Section 2 explains the analytical framework and discusses the role played by schooling history. Section 3 describes the data, provides evidence on the absence of a gender gap among children under the age of 11 and develops the empirical model. Section 4 provides the main estimation results. Section 5 discusses alternative mechanisms to interpret the results while Section 5 gives some concluding comments.

another exam which is considered separately in the paper. Further, and a more general observation, in Cameroon a child is not allowed to repeat the same grade 3 times in the same public school.

2 Analytical framework of gender gap in schooling

This section presents a model for school length. The household has two children: one son and one daughter. The life of a child is divided into two periods. The first is devoted entirely to education and the second is devoted to working. Parents decide on the amount of time their offspring spend at school. We denote the schooling time of child i by E_i and his or her working time by T_i. The common retirement age R is defined by : $R = E_i + T_i$. The index i takes the value m for male and f for female.

We suppose that there is no intra-household competition over resources (Garg and Morduch, 1998) and that the parents have perfect access to credit. Education is regarded as a risk-free investment (Kodde, 1986). Its cost, which is gender specific, is constant and denoted by c_i. The cost is composed of direct schooling costs (tuition fee, uniforms, books, transportation, etc.) and the opportunity cost of the child's time that is devoted to education. Parents care about education because they are altruistic. Their schooling decisions reflect a tradeoff between schooling costs and future earnings (Baland and Robinson, 2000, Bedi and Marshall, 2002).

The utility of the parent depends on the wellbeing of his children and the cost of sending them to school. In a household with a boy and a girl, the utility is written as follows:

$$W_p = \alpha_m U_m(E_m, T_m, \lambda_m) + \alpha_f U_f(E_f, T_f, \lambda_f) - (c_m E_m + c_f E_f) \tag{1}$$

where U_i is the utility of child i. The parameters α_i represent the altruism coefficient of the parent towards the son and the daughter. The parameters λ_i summarize the schooling histories. They are known at the time of the current schooling decisions and reflect schooling irregularities (late enrolment, grades repeating, interruptions) in the child's history. Children who started their educational process at the age of 6 and advance one grade every year have higher value of λ.

The utility of the child depends on λ, on the total amount of time spent at school and on the amount of time devoted to income generating activities or housework afterward. A boy spends his entire working time on income generating activities. His productivity is defined by $Q^m(E_m, \lambda_m)$. We assume that the marginal return to schooling is strictly positive and strictly decreasing ($Q^m_{E_m} > 0$, $Q^m_{E_m E_m} < 0$)[5]. We also suppose that the return to regularity is positive and that the return to education increases with regularity ($Q^m_{\lambda_m} > 0$, $Q^m_{E_m \lambda_m} > 0$). The utility of the boy is defined by the following:

$$U_m = Q^m(E_m, \lambda_m) T_m = Q^m(E_m, \lambda_m)(R - E_m) \tag{2}$$

Unlike a boy, a girl devotes part of her working time to housework. She chooses the amount of time, denoted t, that she spends on household activities such as child care[6], cooking and

[5]This assumption is common in the literature, for example (Orazem and King, 2008, Baland and Robinson, 2000, Bommier and Lambert, 2000).

[6]Child care is considered broadly to include maternity leave.

housekeeping[7]. The productivity of a girl is defined by $Q^f(E_f, \lambda_f)$ and her utility function is written as:

$$U_f = Q^f(E_f, T_f, \lambda_f) = Q^f(E_f, \lambda_f)(R - E_f - t) + u(t) \tag{3}$$

where t is the amount of time spent on housework. We assume that u is positive and concave with u(0)=0 and $u'(0) = +\infty$. We also assume that the features of the productivity function of a girl (Q^f) are similar to those of a boy (Q^m). The choice of t is optimal and satisfies the following first order condition:

$$-Q^f(E_f, \lambda_f) + u'(t^*) = 0 \tag{4}$$

This equation means that, the marginal cost of spending time on housework is $Q^f(E_f, \lambda_f)$ and the marginal gain is u'(t) for the daughter.

Parents decide on the amount of time the son and the daughter will spend at school to maximize their utility. Substituting for U_m and U_f in equation (1), the problem is written as:

$$\begin{aligned} \underset{E_m, E_f}{Max} \quad & \alpha_m \Big(Q^m(E_m, \lambda_m)(R - E_m) \Big) \\ & + \alpha_f \Big(Q^f(E_f, \lambda_f)(R - E_f - t*) + u(t*) \Big) \\ & -(c_m E_m + c_f E_f) \end{aligned} \tag{5}$$

The first-order conditions for time spent at school by the boy and the girl are given by:

$$\alpha_m \frac{\partial Q^m(E_m, \lambda_m)}{\partial E_m}(R - E_m) - \alpha_m Q^m(E_m, \lambda_m) - c_m = 0 \tag{6}$$

$$\alpha_f \frac{\partial Q^f(E_f, \lambda_f)}{\partial E_f}(R - E_f - t^*) - \alpha_f Q^f(E_f, \lambda_f) - c_f = 0 \tag{7}$$

These equations imply that, parents keep children at school until the marginal benefit equals the marginal cost. The gain is related to an increase in productivity induced by an additional year spent at school. The marginal cost involves both direct cost c_i and the opportunity cost since additional time spent at school reduces the amount of time spent on income generating activities.

This framework is general and can generate, under plausible assumptions, many often cited sources of systematic gender gap in schooling[8]. For instance, holding other factors to be the same for both sexes, if the return to education is higher for the boy, that is $Q^f_E(E, \lambda) < Q^m_E(E, \lambda)$, then there will be a pro-male gender gap in schooling. Similarly, if the cost of schooling is higher for females ($c_f > c_m$) all else being equal, then the daughter will receive less schooling. Finally

[7] Hersch and Stratton (1997) provide a detail list of housework activities.

[8] See Alderman and King (1998), Glick (2008) and others.

if because of some cultural factors or social norms, the empathy of parents is higher for the son than for the daughter ($\alpha_m > \alpha_f$)[9], then all being else equal, the daughter will receive less education.

We now impose no gender difference in empathy ($\alpha_m = \alpha_f$), in the cost of education ($c_f = c_m$) and in productivity ($Q^f = Q^m$). In this case, the quality of the schooling history (λ) and the choice of time devoted to housework remain the only sources of the gender gap in schooling.

Proposition 1 *If the son and the daughter have identical schooling histories the daughter will receive less education only if she would participate in housework.*

Proof. We rewrite equations (6) and (7) as follows:

$$\alpha Q_E(E_m, \lambda)(R - E_m) - \alpha Q(E_m, \lambda) - c = 0 \tag{8}$$

$$\alpha Q_E(E_f, \lambda)(R - E_f - t^*) - \alpha Q(E_f, \lambda) - c = 0 \tag{9}$$

If $t^* = 0$, the equalities in equations (8) and (9) are satisfied only if $E_f = E_m$. So the son and the daughter will spend the same amount of time at school. If $t^* > 0$, equalities (8) and (9) hold simultaneously if and only if

$$\alpha Q_E(E_m, \lambda)(R - E_m) - \alpha Q(E_m, \lambda) = c$$

and

$$\alpha Q_E(E_f, \lambda)(R - E_f) - \alpha Q(E_f, \lambda) = c + \alpha Q_E(E_f, \lambda)t*$$

We have that $c + \alpha Q_E(E_f, \lambda)t^* \geq$ c. So $E_f \leq E_m$ because the function $Q_E(x, \lambda)(R - x) - \alpha Q(x, \lambda)$ is decreasing in x.

■

Proposition 2 *If the elasticity of the return to education with respect to the schooling history (λ) is smaller than the elasticity of time devoted to housework with respect to λ, then a marginal improvement in schooling history will have a bigger effect on the education of the daughter.*

Analytically, this proposition is written as follows: if $\frac{\lambda}{Q_\lambda} Q_{E\lambda} < \frac{\lambda}{t^*}(-\frac{\partial t^*}{\partial \lambda})$ then $\frac{\partial E_f}{\partial \lambda} > \frac{\partial E_m}{\partial \lambda}$.

The consequence of this proposition is that, if parents realize that their daughter has some irregularities in her schooling process, they would anticipate that, after her schooling period, she would devote a larger part of her working time to housework. The additional amount of time devoted to education would then not be properly rewarded. If on the contrary, they realize that their daughter is doing well at school, they will anticipate that, after her schooling period, she will spend a larger amount of time on income generating activities and will keep investing

[9] The preferences of parents are biased. They have a "taste for discrimination" Becker (1971).

in her education. This mechanism is not at work for a son because he barely participates in housework.

Proof. The proof is in the appendix. ■

3 Data, econometric model and model specification

3.1 Data

We use data from the 2001 Living Standard Measurement Survey in Cameroon. The sample had 11,000 households. The data provides information on the current enrolment status of children, on their highest grade completed and on the certificates they have. From the data, we can identify the stage of education of each child in 2001. The cameroonian educational system consists of four stages: primary, secondary, post secondary and university. At the end of primary school (grade 6), students have to take the primary schooling certificate (CEP). The CEP is a countrywide exam administered independently by the Ministry of Basic Eduction. It takes place during the same days with the same set of questions for all candidates. Children take this exam when they are around 12 years old. A similar exam, called the secondary school certificate (BEPC), is organized at the end of secondary school. Children who have progressed regularly through school take the BEPC exam when they are around 16 years old.

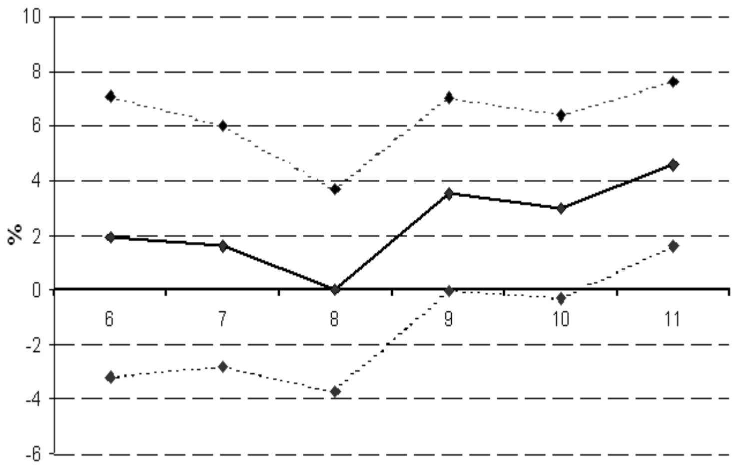


Figure 1: Difference between male and female current enrolment rates: 6-11 years old
The dashed lines indicate a 95% confidence interval.

3.1.1 Choice of the sample

To get to the end of primary education, children must have been enrolled over 5 years and must have successfully completed the corresponding grades. Figure 1 shows the difference in male and female current enrolment rates by age and the 95% confidence interval. The lower bound of the confidence interval is negative up to the age of 10. Under a stationarity assumption, this figure suggests that, the male-female difference in current enrolment rates observed in the data is not significant before the age of 11.

Table 1: Odds ratio and current enrolment rates by gender and age: 6-19 years

	Current enrolment rates				
Age	All	Female	Male	Diff (M-F)	Odds (F/M)
6	0.60	0.59	0.61	1.9	0.92
7	0.78	0.77	0.78	1.6	0.91
8	0.85	0.85	0.85	0.001	1.00
9	0.88	0.86	0.90	3.5	0.72
10	0.89	0.87	0.90	3	0.73
11	0.92	0.90	0.95	4.6*	0.51
12	0.87	0.83	0.90	6.7***	0.55
13	0.86	0.83	0.88	4.9**	0.67
14	0.83	0.79	0.86	7.3***	0.60
15	0.75	0.72	0.78	5.8**	0.73
16	0.72	0.66	0.78	11.9***	0.55
17	0.60	0.54	0.66	11.9***	0.61
18	0.50	0.43	0.58	15.1***	0.54
19	0.46	0.38	0.54	16***	0.52

Diff (M-F) is the difference in male and female percentages. Odds (M/F) is the female over male ratio of the odds of enrolment rates. ** Significant at 5% and * Significant at 10%..

Table 2: Percentage of Children With No Delay: 6-19 years

	% of children with no delay				
Age	All	Female	Male	Diff (M-F)	Odds(F/M)
6					
7	99	99	99	0.10	1.00
8	87	87	88	1.00	1.00
9	84	83	85	2.40	1.00
10	79	79	79	0.40	1.00
11	74	74	74	0.60	1.00
12	64	64	65	1.00	1.00
13	61	63	58	-4.6*	1.00
14	51	54	49	-4.40	1.00
15	45	46	45	-0.80	1.00
16	45	42	47	4.40	1.00
17	36	35	37	1.60	1.00
18	27	24	30	6**	1.01
19	22	19	25	6.4**	1.01

Diff (M-F) is the difference in male and female percentages. ** Significant at 5% and * Significant at 10%. The odds ratio (Odds (M/F)) is the female over male ratio of the odds of percentages.

We observed however a significant difference in male and female enrolment rates after the age of 10 and exceeding 6% from the age of 12 onward (Table 1).

Even if male and female children are equally likely to be enrolled in the early years of primary education, they might evolve at different rhythms. Table 2 shows the percentage of children with some form of schooling irregularities by age. Irregularities are summarized here with schooling delays. A delay can be due to enrolling late , repeating grades or dropping out. It is defined with respect to the theoretical number of completed grades given the age of the child. The theoretical number of completed grades for a child aged 7 is one, given that he or she is supposed to have started primary education at age 6. The theoretical number of completed grades of elder children is defined accordingly[10]. This table suggests that, on average, male and female children are equally likely to have a delay in schooling, and if anything, females are better off.

The percentage of children with no schooling delay is about 80% up to the age of 10, and it drops sharply to about 65% at the age of 12.

Table 3 shows the current enrolment rates of children who have experienced a delay and those who have not in the course of their schooling process. Enrolment rates are lower among children with a schooling delay. There is no gender difference in school enrolment among children with no schooling delay. However, among children with a schooling delay, a significant (5%) gender difference appears at the age of 10. From this age onward, female children in this group seem to be less likely to be enrolled at school.

Table 3: Odds Ratio And Current Enrolment Rates By Gender And Age: 6-19 Years With And Without Delay

	Children with a delay				Children with no delay			
	Cur. enrolment rate			Odds	Cur. enrolment rate			Odds
AGE	Fem	Male	Diff(M-F)	Ratio	Fem	Male	Diff(M-F)	Ratio
6								
7	-	-	-	-	77	78	1.70	1.000
8	1.1	1.2	0.1	3.000	97	96	-1	1.000
9	27	39	12*	1.012	98	98	0.00	1.000
10	44	60	17***	1.006	99	98	-0.8	1.000
11	68	81	13***	1.002	98	99	1.5*	1.000
12	60	78	18***	1.004	97	97	0.07	1.000
13	62	78	16***	1.003	96	95	-0.4	1.000
14	63	77	14***	1.003	93	96	2.70	1.000
15	51	64	13***	1.004	98	96	-2.6	1.000
16	45	63	18***	1.006	95	95	0.05	1.000
17	32	49	17***	1.011	94	95	1.04	1.000
18	26	43	17***	1.015	93	91	-2.3	1.000
19	26	41	14***	1.014	88	94	6.07	1.001

Diff (M-F) is the difference in male and female percentages. *** significant at 1% and * significant at 10%. The odds ratio is the female over male ratio of the odds of enrolment rates. A child has a delay if his or her number of completed year of education is lower than the theoretical number of grades he or she must have completed given his or her age.

The definition of schooling delay used in Tables (2) and (3) relies on schools specific requirements for moving from one grade to the next. The standards are potentially different from one school to another. To use a common standard, we rely on a national standardized exams. We consider for instance, that a child has completed primary education if he or has passed the national exam administered at the end of primary education (CEP). The quality of schooling history is then summarized by holding or not a certificate, outcome of these country-wide exams.

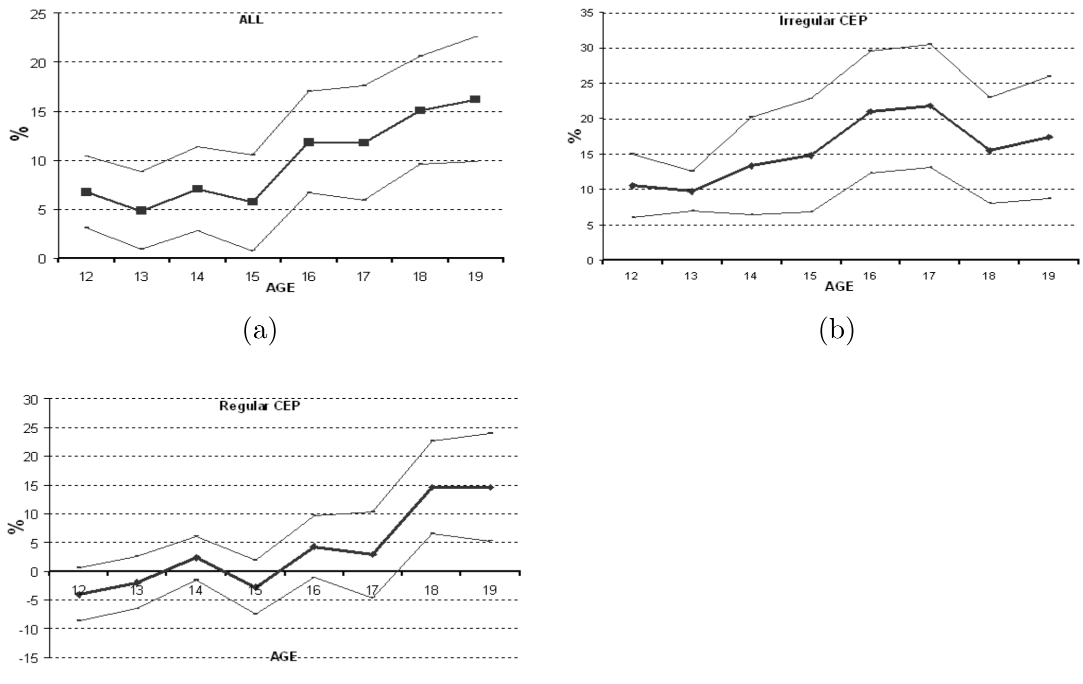
3.1.2 The sample

A child who starts primary school at the age of 6 and advances one grade every year will completed primary education by the age of 12. Our sample, therefore, consists of children aged 12 to 19 years. It contains 9,585 children and is divided into two sub-populations: children of 12

[10]It is actually the number of grades the child would have completed at the time of the survey, had he or she entered at age 6 and advanced one grade each year.

to 15 (53%) and children of 16 to 19 years old. Children aged 12 to 15 who have not completed primary education are called irregular children. They have got up to 3 extra years to pass the CEP exam. Not completing primary education by this age indicates that such a child have either repeated grades, started schooling late[11] or dropped out earlier. Similarly, children aged 16 to 19 years who have not passed the BEPC are called irregular children.

The total enrolment rate in our sample is 71% and is unequally split between males and females. Of the males, 76% are enrolled at school whereas 66% females are enrolled. The enrolment rate is 83% among children aged 12 to 15 years and is lower among children aged 16 to 19 years, about 57%. Figure 2 depicts the difference between male and female enrolment rate by age as well as the 95% confidence interval around it. Figure 2a shows the difference for the sample as a whole. It indicates that male-female differences are significantly positive for all ages considered. As observed in African countries by Orazem and King (2008), the difference increases with age. Figure 2b plots the same difference for irregular children. It shows a similar positive difference that increases with age. However, the difference is not observed among children aged 12 to 17 who passed the CEP exam. Figure 2c shows that the difference is not significantly different from zero up to 17 years old and that it becomes positive only at the age of 18 and 19. The positive difference observed in this last part of the graph (ages 18 and 19) is not very surprising. It corresponds to the situation that exits 6 to 7 years after some children have got their CEP, which is long enough to indicate how far they can go in school, namely if they can pass the BEPC or not.



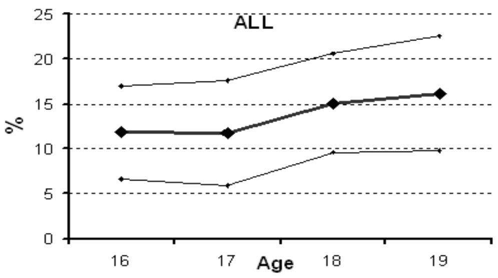
(a) (b)

(c)

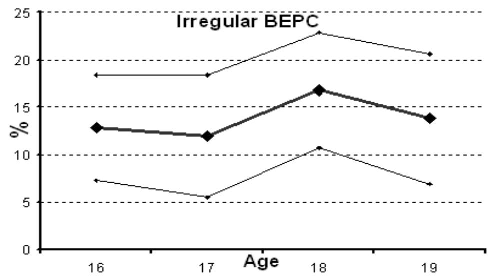
Figure 2: Male-Female Differences in Enrolment Rates: Children Aged 12 to 19

[11]Bommier and Lambert (2000) and Psacharopoulos and Patrinos (1997) studied late enrolment or delayed enrolment.

Figure 3 shows the difference between male and female enrolment rates by age for children aged 16 to 19 as well as the 95% confidence interval around it. Children with and without the BEPC are also considered separately. In this case as well, the gender effect is driven by the difference among irregular children.



(a)



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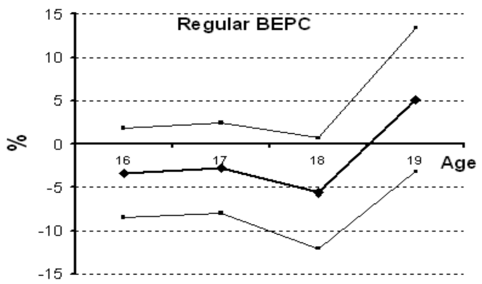

(c)

Figure 3: Male-Female differences in enrolment rates: children aged 16 to 19

The reference exam in this figure is the BEPC and the age group is 16-19.

Table 4 presents enrolment rates by gender and age groups. It indicates that, on average, being a boy significantly increases the likelihood of being enrolled at school. If we divide the sample with respect to schooling regularity, we observe higher enrolment rates and no gender difference among regular children. In contrast, irregular children have lower enrolment rates and display a significant gender differences in enrolment rates. So the gender gap observed seems to be driven mainly by the differences observed among irregular children.

Table 4: Enrolment Rates By Gender And Age Group

	Age 12-15			Age 16-19		
	All	Irregular	Regular	All	Irregular	Regular
Female	79.8	70.1	93.8	50.5	44.8	93.0
Male	85.8	81.9	92.2	64.5	59.3	92.2
Male-Female	6.0***	11.8***	-1.6	14.0***	14.5***	-0.8

The enrolment rate of the 12-15 group is 83%. The enrolment rate of children in the age group 16-19 is is 57%. *** Significant at 1%. Male-Female is the difference between male and female enrolment rates. All indicates all children of the age group considered. Irregular means those who do not have the CEP certificate among the 12-15. Among the 16-19, it means those who do not have the BEPC certificate. Regular means those who have the CEP certificate among the 12-15. Among the 16-19, it means those who have the BEPC certificate. We do not exclude children aged 16 to 19 who do not have the CEP certificate. If they had been excluded, we would have observed a change in the magnitude of the difference but not a change in the pattern.

Table 5 shows the allocation of the sample by gender. It suggests that patterns of gender difference in enrolment rates are not driven by the gender structure of the sample. Actually, the results are reproduced in two sub-samples with different gender structures. In the first, children aged 12 to 15, males and females are equally represented and the proportion of irregular children is higher among males. In the second, children aged 16 to 19, there are slightly more females and the proportion of irregular children is higher among females.

Table 5: Allocation by gender

	Age 12-15		Age 16-19	
	% in sample	% Irregular	% sample	% Irregular
Female	50	57	51	84
Male	50	61	49	79
Total	100	41	100	18
Male-Female		4***		-5***

% in sample is the percentage of males and females in the sample . % Irregular is the percentage of irregular children in the sub samples of males and females. Male-Female is the difference between the male and the female percentages. *** Significant at 1%.

3.2 Econometric model

We measure the quality of the schooling history with a dichotomous variable. In one group, there are children with irregular schooling histories and in the other, children with regular schooling histories. The objective of this section is then to provide an econometric framework that allows us to test whether the male-female difference in school enrolment exists within the two groups of children.

Regular and irregular children are at different stage of education. For instance, irregular children of 12 to 15 years have not completed primary education, whereas regular children have. Regarding school enrolment, the former are to be enrolled in primary school while the latter are to be enrolled in secondary school[12]. Figure 4 illustrates the structure of the modeling strategy.

If being regular were a pure random even, then the probability of being enrolled in school would be independent of the probability of being a regular child. The selection into the two regularity groups would be ignored and the econometric framework would consist of estimating binary choice models. However, this possibility is unrealistic. Children from different families have different probabilities of attending or of passing exams at given age (Cameron and Heckman, 2001, Mare, 1980, Dreze and Kingdon, 2001). The selection into the groups of children should be explicitly taken into account.

We use the structure provided by Figure 4 to describe the econometric framework. Let Y_R be a binary variable indicating whether a child is regular or not. Let Y_1 and Y_2 be two binary variables representing the school enrolment decisions for irregular and regular children respectively. The variable Y_1 (respectively Y_2) is relevant only when the variable Y_R takes the value 0 (respectively 1). The probabilities to be enrolled are given by the following:

[12]Ten children in the data were in secondary school and did not have the CEP. They were excluded from the sample.

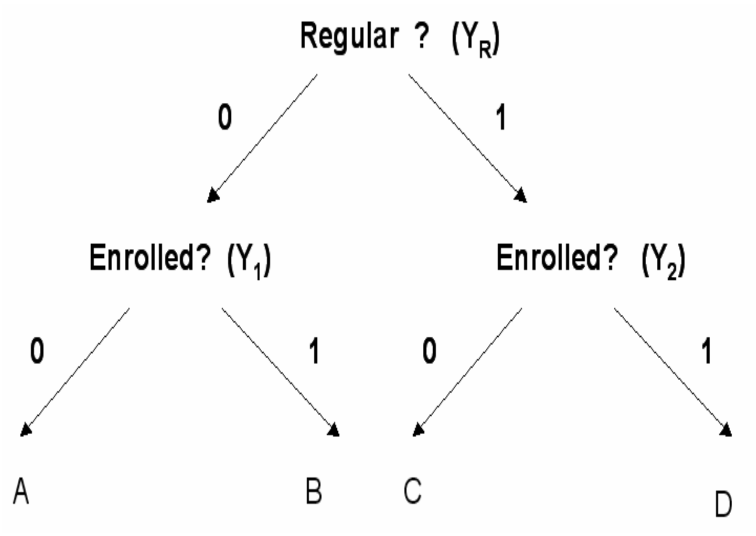

Figure 4: A model of school enrolment of children aged 12 to 15

A indicates irregular children who are not currently enrolled. B indicates irregular children who are currently enrolled. C indicates regular children who are not currently enrolled. D indicates regular children who are currently enrolled.

$$
\begin{aligned}
P(\mathrm{B}) &= P(Y_1 = 1 \mid Y_R = 0) * P(Y_R = 0) \\
&= P(Y_1 = 1, Y_R = 0)
\end{aligned}
$$

$$
\begin{aligned}
P(\mathrm{D}) &= P(Y_2 = 1 \mid Y_R) * P(Y_R = 1) \\
&= P(Y_2 = 1, Y_R = 1)
\end{aligned}
$$

Let us define Y_j^* as the index function associated to Y_j (j=R,1,2) by:

$$
\begin{aligned}
Y_{ji}^* &= Z'_{ji}\gamma_j + u_{ji} \\
&= \beta_j^0 + \beta_j^F * Female_i + X'_{ji}\beta_j + u_{ji}
\end{aligned}
$$

where i indicates individuals, $\gamma_j = (\beta_j^0, \beta_j^F, \beta_j)$ is the vector of parameters, $Z_j = (1, Female, X_j)$ is the set of regressors, and u_{ji} is the unobserved error term. Female is a dummy variable that takes the value 1 for females. We assume that $u_{ji} \sim N(0,1)$.

The outcomes of being irregular and of being enrolled are observed on the same child. They are related by a child specific unobserved heterogeneity (Lillard and Willis, 1994, Pal, 2004). Therefore, u_{R_i} and u_{1_i} are correlated. Similarly u_{R_i} and u_{2_i} are correlated. We denote the correlation coefficients by: $corr(u_{R_i}, u_{1_i}) = \rho_1$ and $corr(u_{R_i}, u_{2_i}) = \rho_2$.

This formulation is general and leaves open the possibility that different sets of regressors determine enrolment for both irregular and regular children. It also leaves open the possibility that, a given regressor may differently affect the likelihood of being enrolled for a child among the irregular group and a child among the regular group. We indeed expect the gender effect to be different for irregular and regular children. We will test the hypothesis that β_1^F is significant and negative whereas β_2^F is not significantly different from zero. The assumption that the gender gap in current school enrolment is independent of the schooling history corresponds to having both β_1^F and β_2^F significantly negative.

The predicted probability of the observed outcomes for any observation i is given by $\Phi_2(\mu_{ji}, \Omega_j)$ where Φ_2 is a bivariate standard normal cumulative distribution function with arguments $\mu_{ji} = (\kappa_{ji} Z_{ji}^{'} \gamma_j, \kappa_{R_i} Z_{R_i}^{'} \gamma_R)$ and Ω_j. The index j takes the values 1 or 2. The symbol κ_l, (l= R, 1, 2), denotes a "sign" variable and is defined by $\kappa_l = 2 * Y_l - 1$ for each observation. The 2 by 2 matrices Ω_j have constituent elements Ω_{jtk} defined by $\Omega_{j11} = \Omega_{j22} = 1$ and $\Omega_{j12} = \Omega_{j21} = \kappa_j \kappa_1 \rho_j$.

The log-likelihood function of observations is:

$$L = \Sigma_i^n 1_{iA} log(P_{iA}) + 1_{iB} log(P_{iB}) + 1_{iC} log(P_{iC}) + 1_{iD} log(P_{iD}) \tag{10}$$

where $1_{ix} = 1\{x\}$ is an indicator function with x =A,B,C,D.

The identification of this model relies on the set of variables indicating the supply of schools and the nonlinearities of the functional form used[13] (Wooldridge, 2002).

If we assume that there is no child specific unobserved heterogeneity, we would have that $\rho_1 = \rho_2 = 0$ which implies that u_R, u_1 and u_2 are independent. The parameters γ_R, γ_1 and γ_2 could be estimated with three simple probit models.

3.3 Model specification

Section 2 indicates that, the probability of being enrolled in school is affected not only by gender but also by other factors. To separate out the effects of these factors, it is necessary to specify a model with a suitable set of explanatory variables.

Participation in the labor market: Child labor is seen as an opportunity cost of child's time that is devoted to schooling. It is therefore appropriate to use some demand factors of child labor as control variables. The first set of such variables is related to the demand for child labor originating from the household. In general the activities the household engages in, shape the demand for child labor within the household. As a result, we use covariates indicating activities of the head of the household or his spouse: non-wage worker, self employed in agriculture or in trader. These variables indicate respectively whether the head of small business.

Basu (1998) suggests that child labor and adult labor are substitutes for one another. Thus the extent of local job opportunities for children can be provided by the local adult participation rate in the labor market. Adults local participation rates in labor market[14] and in the informal sector are used as regressors in the schooling equations. These participation rates also reflect the demand factors for child labor originating from outside the household[15] and the extent of future job opportunities (Rosenzweig and Schultz, 1982). In addition, we expect that child labor occurs mainly in the informal sector.

[13]This is similar to what is commonly done with the probit selection equation of non-response that lead to missing data.

[14]Pal (2004) uses this variable for a study on school attainment in Peru.

[15]Fafchamps and Wahba (2006) show that children living in or near cities are more likely to work.

Table 6: Descriptive Statistics Of The Variables Used

	AGE 12-19		AGE 12-15		AGE 16-19	
	mean	sd	mean	sd	mean	sd
Age	15.34	2.28	13.46	1.13	17.44	1.09
Female	0.50		0.50		0.51	
Head has primary level	0.35		0.35		0.35	
Head has secondary level	0.33		0.32		0.35	
Head has university level	0.07		0.07		0.08	
Head sex (Male=1)	0.78		0.78		0.77	
Age of head	46.15	13.18	47.23	12.56	44.95	13.75
Muslim	0.39		0.38		0.41	
Christian	0.69		0.68		0.71	
Estimated expenditure per capita	3.14	3.13	2.91	3.09	3.39	3.15
Rural	0.28		0.31		0.25	
Head or spouse non wage worker	0.67		0.69		0.65	
Head or spouse (non wage) in agri	0.40		0.43		0.36	
Head or spouse (non wage) in trade	0.21		0.21		0.22	
Son/daughter of head	0.65		0.72		0.57	
Distance to private primary school	2.28	4.72	2.46	4.92	2.08	4.48
Distance to public primary school	1.06	1.88	1.13	2.08	0.99	1.61
Distance to private secondary school	4.07	6.06	4.37	6.27	3.74	5.80
Distance to public secondary school	3.64	4.98	3.87	5.17	3.38	4.74
Local participation to labor market	0.71	0.17	0.72	0.17	0.70	0.17
Local participation rate to informal sector	0.43	0.21	0.45	0.22	0.42	0.21
# of 0-5 years	1.07	1.26	1.13	1.28	1.00	1.23
# of male of 6-11 years	0.73	0.96	0.81	1.01	0.63	0.89
# of female of 6-11 years	0.69	0.94	0.77	0.98	0.60	0.90
# of male of 12-15 years	0.71	0.82	0.93	0.84	0.48	0.72
# of female of 12-15 years	0.72	0.84	0.93	0.86	0.50	0.75
# of male of 16-19 years	0.66	0.85	0.45	0.74	0.90	0.91
# of female of 16-19 years	0.62	0.76	0.42	0.67	0.85	0.79
# of male of 20-35 years	0.63	0.96	0.54	0.92	0.73	1.00
# of female of 20-35 years	0.70	0.87	0.73	0.86	0.67	0.88
# of over 35 years	1.56	1.03	1.63	1.00	1.49	1.06
N	9585		5067		4518	

The mean of a dummy variable is proportion.

Supply side variables: One needs to control for school supply-side factors on enrolment decisions (Bedi and Marshall, 2002, Dreze and Kingdon, 2001). They reflect school quality, school proximity and cost (Behrman et al., 2008). Public primary school is free in Cameroon and tuition fees in public secondary school are identical across the country. Thus the relevant discriminating part of the cost of education is related to transportation cost and other schooling direct costs (uniforms, books, PTA fees,etc.). The data provide only the distance to the nearest primary or secondary school but not other school quality characteristics. If we assume that transportation costs are related to distance, we can proxy transportation cost by the distance to the nearest school. We consider separately the distance to a public school and a private school to reflect the differences in these two types of schools. We further distinguish the distance to a primary and a secondary school to reflect differences in the supply of the two levels of education. In our sample, the average distance to a public primary school for a given child is 1 kilometer. He or she needs to walk on average one more kilometer to reach the nearest private primary school. In general secondary schools are located farther away than primary ones. A child needs to walk, on average, 2 to 3 additional kilometers to reach a secondary school.

The residential location (urban or rural) children in a developing country may reflect the quality of the local public services to which they have access. Well trained teachers prefer working in cities rather than in villages, therefore distorting the quality of services offered by schools.

Household resource constraints: In a country with an imperfect credit market, household resource constraints play an important role in school investments (Baland and Robinson, 2000, Basu, 1998). We expect children from credit constrained households, actually poor households, to have a lower probability of attending school. The data does not provide information on credit constraints. They do however contain household expenditures which is considered to be an indicator for the household's standard of living. But household expenditures are potentially related to schooling decisions in a household model. Consequently, we use predicted values[16] instead of the actual values, of household expenditure per capita.

Household preferences and structure: Section 2 noted the importance of parental preferences on schooling decisions. These preferences are difficult to quantify. Therefore, the education level of parents is used to capture their attitude towards schooling decisions.

Finally, we control for the structure of the household in terms of the number of household member per age group(Psacharopoulos and Patrinos, 1997). We consider separately the number of females and males in the schooling age groups. This allow us to capture differential effect related to their presence in the household (Garg and Morduch, 1998). Further the number of adults in the households controls for the number of economically active family members (Manacorda, 2006).

The summary statistics of selected regressors classified by age groups are shown by Table 11 in the appendix.

[16] The identifying instruments were head of household characteristics, household structure, durable goods owned, geographical dummies, usable land owned. The adjusted R-squared of the OLS regression is 0.3.

4 Results

The model shown in equation 10 is estimated on children aged 12-15[17]. Estimated coefficients are shown in Table 7. The coefficients ρ_{21} and ρ_{31} are significantly different from zero. This suggests that child specific heterogeneity is significant. We then conclude that ignoring the correlation structure of the data would give rise to inconsistent estimates.

The coefficient on gender is significantly negative for irregular children. This means that an irregular female aged 12 to 15 is less likely to be enrolled at school. In contrast, the coefficient on gender is positive and non significant for regular children. So, the effect of gender on the likelihood of being enrolled in school is not significantly different from zero among regular children aged 12 to 15. If it has any effect, it would be to increase the likelihood that the female will be enrolled. The coefficient on gender in the column labeled regular in Table 7 is not significant. It suggests that gender plays no role in the division into groups of regular and irregular children.

As a robustness check, we estimate the model on children aged 16 to 19. Estimated coefficients are presented in Table 9 in the appendix. Here as well, the gender effect on school enrolment is significant only for irregular children.

Table 7: Estimated Coefficients of the Joint Model on Children Aged 12 to 15.
Regularity is based on CEP exam.

	Regular	**Enroll irregular**	**Enroll regular**
Age	0.368	-0.198	0.178
	(19.79)***	(4.15)***	(2.09)**
Female	0.090	-0.411	0.128
	(1.47)	(4.74)***	(1.32)
Head has primary level	0.457	0.717	0.281
	(7.15)***	(9.98)***	(2.02)**
Head has secondary level	0.868	1.090	0.732
	(11.51)***	(10.24)***	(4.75)***
Head has university level	1.052	1.140	0.873
	(9.19)***	(5.18)***	(3.90)***
Head sex (Male=1)	-0.232	-0.449	-0.047
	(4.33)***	(5.61)***	(0.45)
Age of head	0.012	0.010	0.013
	(5.20)***	(3.46)***	(3.75)***
Muslim	0.004	-0.146	0.070
	(0.09)	(1.80)*	(0.90)
Christian	0.375	0.833	0.376
	(6.57)***	(10.73)***	(3.96)***

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[17]The results of the model estimated on children age 16 to 19 is in Table 9 in the appendix. We also estimated the model on the pool sample of all children. We keep the definition of irregular children in the process and consider enrolment more generally. The results (not shown here) on gender effect were qualitatively similar to those presented in this paper.

Table 7 – Continued

	Regular	Enroll irregular	Enroll regular
Estimated expenditure per head	0.070	0.053	0.079
	(6.36)***	(2.74)***	(4.56)***
Rural	-0.040	-0.033	0.047
	(0.56)	(0.36)	(0.39)
Head or spouse non-wage worker	-0.057	0.001	-0.245
	(0.84)	(0.01)	(2.08)**
Head or spouse (non-wage) in agri	-0.108	-0.067	0.092
	(1.50)	(0.71)	(0.70)
Head or spouse (non-wage) in trade	-0.106	-0.080	-0.031
	(1.60)	(0.92)	(0.30)
Son/daughter of head	0.064	0.381	0.343
	(1.37)	(5.81)***	(3.29)***
Distance to private primary school	-0.037	-0.011	
	(5.31)***	(1.87)*	
Distance to public primary school	-0.017	-0.021	
	(0.96)	(1.96)**	
Distance to private secondary school	-0.005		0.003
	(0.88)		(0.26)
Distance to public secondary school	-0.034		-0.080
	(4.43)***		(5.54)***
Local participation to labor market	-0.168	0.074	-0.711
	(0.96)	(0.31)	(2.24)**
Local participation rate to informal sector	-0.044	-0.054	-0.053
	(0.33)	(0.36)	(0.24)
# of 0-5 years	-0.035	0.003	-0.000
	(1.75)*	(0.13)	(0.00)
# of male of 6-11 years	0.016	0.018	-0.032
	(0.70)	(0.67)	(0.80)
# of female of 6-11 years	0.039	0.004	0.067
	(1.66)*	(0.15)	(1.67)*
# of male of 12-15 years	0.066	0.063	0.063
	(2.05)**	(1.44)	(1.20)
# of female of 12-15 years	0.043	-0.004	0.067
	(1.32)	(0.08)	(1.30)
# of male of 16-19 years	0.033	0.012	0.075
	(1.13)	(0.28)	(1.55)
# of female of 16-19 years	0.093	0.044	0.065
	(2.92)***	(0.94)	(1.25)
# of male of 20-35 years	-0.006	0.051	-0.005
	(0.27)	(1.39)	(0.15)
# of female of 20-35 years	0.035	0.029	-0.024
	(1.29)	(0.79)	(0.50)
# of over 35 years	-0.022	0.100	-0.037
	(0.79)	(2.73)***	(0.82)
Constant	-6.345	2.205	-3.261

Continued on Next Page...

Table 7 – Continued

	Regular	**Enroll irregular**	**Enroll regular**
	(19.74)***	(3.43)***	(2.00)**
Rho1		0.546	
		(2.28)**	
Rho2		0.860	
		(6.38)***	
Observations		5067	
Test: $\beta^F_{primary} = \beta^F_{second}$		$\chi^2(1) = 18$	p=0.000

The dependent variables Regular, Enroll irregular and Enroll regular are all dummy variables. Regular takes value 1 if the child is considered regular. Enroll irregular takes value 1 if the Irregular child is enrolled in school. Enroll regular takes value 1 if the regular child is enrolled in school. Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

5 Discussion

Section 2 suggests one plausible mechanism to explain why the gender gap in current enrollment is observed only among irregular children. If, from the schooling history, the parents realize that their daughter shows some irregularities in her school progression rhythm, they would anticipate that, after her schooling period, she would devote a larger part of her working time to housework. Further investment in her education would therefore not be properly rewarded. Parents would then have a lower incentive to keep investing in her education. Table 8[18] provides indirect evidence of this mechanism. It shows the average number of hours devoted to income generating activities over a month. It suggests that, on average, male and female children who were regular at school indeed spent the same amount of time in income generating activities after their schooling period. Female who were irregular spent on average a lower amount of time on income generating activities. However, figures in this table are not exempt of bias due to the determinants of occupational choice (Banerjee and Newman, 1993). We can therefore think of two other possible mechanisms.

Table 8: Number of Hours Devoted to Income Generating Activities over a Month

		20 - 24 years	
		Female	Male
CEP	Weak	35	46
	Able	39	48
	Regular-Irregular	4*	2
BEPC	Weak	36	47
	Able	42	45
	Regular-Irregular	6*	2

First, one might think that parents under-invest in a female's education from the age of

18

6 onward and that what we observe at the age of 12 is simply the continuation of what has started many years earlier. This scenario corresponds to having female education costs higher than male education costs. In this case, we would then have a pro male gender gap in school enrolment at every age. But Tables 1 and 3 suggest that, under the stationarity assumption, there is not gender gap in current enrolment rate before the age of 10. Furthermore, when the gender difference appears, it is observed only among children that have shown some schooling irregularities. By the same token, the possibility that parents invest more in female education when the child is at an early age is not very plausible.

Second, the (opportunity) cost of schooling might be the same for males and females around the age of 6 but it becomes higher for females around the age of 12. If this were the case, all female children would face the same cost around the age of 12 and they would all be less likely to be enrolled at school. We would then observe a gender gap both among irregular and regular children. However, we have observed a gender gap in current enrolment rates only among irregular children(see Figure 2). This reasoning suggests that, difference in cost is not a driving force in our results.

We have assumed in the empirical model (section 3.2) that a child specific heterogeneity affects both schooling regularity and enrolment. If this hypothesis is relaxed, then u_1 and u_R are independent. The error terms u_R and u_2 are independent as well. Estimating model 10 is reduced to estimating two independent probit models. Table 10 in the appendix presents the corresponding estimation results. They show some differences compared to the initial results reported on table 7. For instance, on the role played by the education of household head or the indicator of family wealth[19]. However the message on gender gap is not altered.

One limitation of our data is that they do not provide the exact year at which children passed their exams. It is not possible to know when a child, say of 15 years old, succeeded the CEP exam. Moreover, we do not know how an irregular child, say of 13 years old, would fare the next year. Thus with our definition of regularity, a child aged 15 who passed the CEP when he was 14 years old is classified as regular whereas a child aged 13 who did not have the CEP is classified as irregular. We check that our result is robust to the definition of regularity by estimating the model only on children aged 14 and only on children aged 17. The results, not shown, remain similar.

6 Conclusion

This paper examines the gender difference in the likelihood of being enrolled at school. The current literature suggests that in many African countries, male children are more likely to be enrolled at school than are females. It treats identically children who have different schooling histories. We have introduced an approach that consists of allowing a different gender effect on the probability of being enrolled in school for children with different schooling histories. We study current enrolment among regular and irregular children. Regular children are those who

[19]They have minor effect on the probability of being enrolled in secondary school (Mare, 1980).

completed primary education between the ages of 12 and 15.

Our econometric framework accounts explicitly for selection of children into the groups of regular and irregular children. It jointly estimates the probability of being a regular child and being currently enrolled. We estimate this model a cameroonian database. The particularity of this country is that, there is a weak male-female difference in current enrolment rate among young children (6-10 years).

Results of the estimated model show no male-female difference in the likelihood of being enrolled in school among regular children. However, among irregular children, females are less likely to be enrolled in school than are males.

While enrolment has become less problematic for very young children, dropping out of school remains important for children aged 12 or more, especially female. Our results suggest that, female children are given a schooling possibility to start with but are more exposed to dropping out if they display any form of irregularity in the course of their education. Therefore, one way to reduce the gender gap in current school enrolment would be to reduce grade repetition, in particular, female grade repetition.

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7 Appendix

Proof of proposition 2.

Proof.

From equations (6) and (7), we have the following static comparative equation for the son and the daughter.

$$\frac{\partial E_m}{\lambda} = -\frac{Q_{E\lambda}(R - E -) - Q_\lambda}{Q_{EE}(R - E - t^*) - Q_E(1 - t^*_E) - Q_E} \tag{11}$$

$$\frac{\partial E_f}{\lambda} = -\frac{Q_{E\lambda}(R - E - t^*) - Q_E t^*_\lambda - Q_\lambda}{Q_{EE}(R - E - t^*) - Q_E(1 - t^*_E) - Q_E} \tag{12}$$

We suppose that Q is sufficiently concave so that

$$Q_{EE}(R - E - t^*) - Q_E(1 - t^*_E) - Q_E < 0$$

. Given that $Q_E t^*_E > 0$ the denominator of equation (11) is smaller than the denominator of equation (12). A sufficient condition to have $\frac{\partial E_m}{\lambda} < \frac{\partial E_f}{\lambda}$ is that

$$Q_{E\lambda} t^* - Q_E t^*_\lambda > 0$$

The is equivalent to $\frac{Q_{E\lambda}}{Q_E} < -\frac{t^*_\lambda}{t^*}$ or $Q_{E\lambda}\frac{\lambda}{Q_E} < t^*_\lambda \frac{\lambda}{t^*}$.

■

Table 9: Estimated coefficients of the joint model on children aged 16 to 19.
Regularity is based on BEPC exam.

	Regular?	**Enroll Irregular**	**Enroll Regular**
Age	0.299	-0.268	-0.200
	(12.56)***	(7.67)***	(0.86)
Female	-0.375	-0.498	-0.032
	(4.91)***	(7.25)***	(0.11)
Head has primary level	0.246	0.272	-0.470
	(2.68)***	(4.36)***	(1.07)
Head has secondary level	0.642	0.755	-0.001
	(6.45)***	(10.05)***	(0.00)
Head has university level	0.860	1.007	0.030
	(6.62)***	(7.76)***	(0.05)
Head sex (Male=1)	-0.235	-0.291	-0.152
	(3.80)***	(5.27)***	(0.77)
Estimated expenditure per head	0.110	0.071	0.062
	(9.08)***	(5.15)***	(1.07)
Age of head	0.009	0.006	0.008
	(3.12)***	(2.42)**	(0.80)
Rural	-0.402	0.053	-0.706
	(3.67)***	(0.69)	(2.22)**
Head or spouse non-wage worker	-0.177	-0.170	-0.359
	(2.22)**	(2.30)**	(1.68)*
Head or spouse (non-wage) in agri	-0.006	0.112	0.420
	(0.07)	(1.47)	(1.42)
Head or spouse (non-wage) in trade	0.090	0.073	0.079
	(1.10)	(1.04)	(0.35)
Son/daughter of head	0.372	0.535	0.618
	(6.32)***	(10.09)***	(3.26)***
Distance to private primary school	-0.015	-0.005	
	(1.07)	(0.78)	
Distance to public primary school	-0.064	-0.014	
	(1.96)**	(0.80)	
Distance to private secondary school	-0.015	0.002	-0.015
	(1.79)*	(0.32)	(0.64)
Distance to public secondary school	-0.016	-0.046	-0.034
	(1.20)	(6.51)***	(0.84)
Local participation to labor market	-0.232	-0.128	0.920
	(1.10)	(0.68)	(1.37)
Local participation rate to informal sector	0.039	-0.264	-0.847
	(0.21)	(1.97)**	(1.43)
# of 0-5 years	-0.038	-0.077	-0.098
	(1.39)	(3.57)***	(1.23)
# of male of 6-11 years	0.008	-0.008	0.033
	(0.24)	(0.31)	(0.32)

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Table 9 – Continued

	Regular?	**Enroll Irregular**	**Enroll Regular**
# of female of 6-11 years	0.024	0.060	0.103
	(0.77)	(2.25)**	(0.99)
# of male of 12-15 years	0.040	0.101	-0.153
	(1.05)	(3.11)***	(1.31)
# of female of 12-15 years	0.101	0.047	0.091
	(2.77)***	(1.44)	(0.75)
# of male of 16-19 years	-0.004	0.102	-0.006
	(0.11)	(3.05)***	(0.06)
# of female of 16-19 years	0.143	0.243	0.067
	(3.56)***	(6.26)***	(0.48)
# of male of 20-35 years	0.012	-0.058	-0.100
	(0.48)	(2.35)**	(1.54)
# of female of 20-35 years	0.057	0.078	0.216
	(1.80)*	(2.77)***	(2.14)**
# of over 35 years	-0.000	0.065	0.144
	(0.01)	(2.17)**	(1.24)
Constant	-7.127	4.097	3.426
	(14.78)***	(6.58)***	(0.61)
Rho1		0.664	
		(3.60)***	
Rho2		0.415	
		(0.69)	
Observations		4518	
Test: $\beta_e^F nrolled = \beta^F_{enrolled_{post}}$		$\chi^2(1) = 2.31$	p=0.12

The dependent variables Regular, Enrolled irregular and Enroll regular are all dummy variables. Regular takes value 1 if the individual have succeeded the BEPC exam. Enrolled irregular takes value 1 if the individual with no BEPC is enrolled at school. Enrolled regular takes value 1 if the individual with BEPC is enrolled at school. Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: Estimated coefficients of 3 probit models: Case of the CEP.

	Regular	**Enroll irregular**	**Enroll regular**
	Regular	Enroll irregular	Enroll regular
Age	0.366	-0.286	-0.116
	(19.64)***	(11.14)***	(2.58)***
Female	0.108	-0.454	0.100
	(1.76)*	(5.33)***	(0.71)
Head has primary level	0.446	0.673	-0.090
	(6.96)***	(8.99)***	(0.58)
Head has secondary level	0.851	0.957	0.205
	(11.29)***	(8.75)***	(1.13)
Head has university level	1.040	0.929	0.220
	(9.08)***	(4.12)***	(0.82)
Head sex (Male=1)	-0.234	-0.423	0.169
	(4.35)***	(5.02)***	(1.49)
Age of head	0.011	0.008	0.008
	(5.06)***	(2.77)***	(1.56)
Muslim	0.004	-0.159	0.103
	(0.08)	(1.86)*	(0.97)
Christian	0.375	0.800	0.178
	(6.54)***	(9.87)***	(1.34)
Estimated expenditure per head	0.071	0.035	0.054
	(6.41)***	(1.82)*	(2.16)**
Rural	-0.028	0.008	0.151
	(0.38)	(0.09)	(0.92)
Head or spouse non-wage worker	-0.065	0.029	-0.335
	(0.95)	(0.27)	(2.25)**
Head or spouse (non-wage) in agri	-0.093	-0.057	0.282
	(1.30)	(0.58)	(1.76)*
Head or spouse (non-wage) in trade	-0.098	-0.064	0.050
	(1.47)	(0.71)	(0.35)
Son/daughter of head	0.066	0.388	0.478
	(1.41)	(5.76)***	(4.72)***
Distance to private primary school	-0.036	-0.005	
	(5.00)***	(0.84)	
Distance to public primary school	-0.015	-0.017	
	(0.79)	(1.60)	
Distance to private secondary school	-0.004		0.017
	(0.65)		(1.27)
Distance to public secondary school	-0.039		-0.083
	(5.49)***		(5.03)***
Local participation to labor market	-0.130	0.114	-0.919
	(0.74)	(0.46)	(2.27)**
Local participation rate to informal sector	-0.065	-0.004	-0.133
	(0.48)	(0.02)	(0.41)
# of 0-5 years	-0.031	0.004	0.039

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Table 10 – Continued

	Regular	**Enroll irregular**	**Enroll regular**
	(1.54)	(0.15)	(0.83)
# of male of 6-11 years	0.011	0.016	-0.064
	(0.47)	(0.55)	(1.18)
# of female of 6-11 years	0.035	-0.003	0.074
	(1.49)	(0.11)	(1.28)
# of male of 12-15 years	0.068	0.056	0.020
	(2.08)**	(1.22)	(0.26)
# of female of 12-15 years	0.042	-0.013	0.059
	(1.31)	(0.28)	(0.79)
# of male of 16-19 years	0.035	0.003	0.078
	(1.20)	(0.06)	(1.13)
# of female of 16-19 years	0.097	0.026	0.007
	(3.03)***	(0.54)	(0.09)
# of male of 20-35 years	-0.009	0.054	-0.000
	(0.40)	(1.42)	(0.01)
# of female of 20-35 years	0.035	0.020	-0.074
	(1.29)	(0.52)	(1.21)
# of over 35 years	-0.018	0.105	-0.026
	(0.64)	(2.79)***	(0.39)
Constant	-6.320	3.255	2.740
	(19.55)***	(7.50)***	(3.61)***
Observations	5067	2991	2076

The dependent variables Regular, Enrolled irregular and Enroll regular are all dummy variables. Regular takes value 1 if the individual have passed the CEP exam. Enrolled irregular takes value 1 if the individual with no CEP is enrolled at school. Enrolled regular takes value 1 if the individual with CEP is enrolled at school. Absolute value of z statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 11: Descriptive statistics of the variables: other sub samples

	AGE 12-15				Age 16-19			
	Irregular		Regular		Irregular		Regular	
	mean	sd	mean	sd	mean	sd	mean	sd
Age	13.21	1.10	13.82	1.06	17.36	1.09	17.84	1.02
Female	0.48		0.52		0.52		0.44	
Head has primary level	0.38		0.30		0.38		0.23	
Head has secondary level	0.22		0.46		0.32		0.51	
Head has university level	0.03		0.12		0.05		0.19	
Head sex (Male=1)	0.80		0.75		0.78		0.74	
Age of head	48.00	12.65	46.12	12.34	44.73	14.10	45.94	11.99
Muslim	0.33		0.46		0.38		0.52	
Christian	0.59		0.81		0.68		0.84	
Estimated expenditure per head	2.06	2.71	4.15	3.18	2.92	2.89	5.54	3.36
Rural	0.42		0.15		0.30		0.05	
Head or spouse non-wage worker	0.79		0.55		0.69		0.46	
Head or spouse (non-wage) in agri	0.54		0.27		0.40		0.15	
Head or spouse (non-wage) in trade	0.21		0.20		0.22		0.22	
Son/daughter of head	0.73		0.70		0.55		0.64	
Distance to private primary school	3.43	5.86	1.07	2.51	2.38	4.84	0.72	1.59
Distance to public primary school	1.35	2.60	0.82	0.82	1.05	1.74	0.71	0.71
Distance to private secondary school	5.66	7.10	2.51	4.20	4.19	6.17	1.70	3.00
Distance to public secondary school	5.09	6.08	2.10	2.62	3.77	5.10	1.63	1.63
Local participation to labor market	0.76	0.18	0.68	0.16	0.72	0.17	0.63	0.14
Local participation rate to informal sector of adults	0.49	0.23	0.39	0.19	0.43	0.21	0.33	0.16
# of 0-5 years	1.28	1.38	0.91	1.10	1.06	1.27	0.72	0.99
# of male of 6-11 years	0.87	1.08	0.73	0.89	0.65	0.91	0.54	0.80
# of female of 6-11 years	0.82	1.01	0.70	0.93	0.62	0.92	0.54	0.80
# of male of 12-15 years	0.96	0.85	0.88	0.84	0.48	0.73	0.44	0.67
# of female of 12-15 years	0.90	0.87	0.97	0.84	0.49	0.74	0.54	0.78
# of male of 16-19 years	0.42	0.72	0.49	0.77	0.88	0.92	0.97	0.84
# of female of 16-19 years	0.38	0.64	0.48	0.71	0.85	0.77	0.86	0.85
# of male of 20-35 years	0.51	0.87	0.59	0.99	0.71	0.95	0.82	1.19
# of female of 20-35 years	0.73	0.89	0.74	0.82	0.66	0.87	0.72	0.90
# of over 35 years	1.68	1.03	1.56	0.96	1.47	1.08	1.56	0.96
	2991		2076		3700		818	

The mean of a dummy variable is proportion.

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