DOES EDUCATION REPRESENT A SOCIAL PROTECTION FOR LIFETIME IN SUB-SAHARAN AFRICA?

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**MOBILISING EUROPEAN RESEARCH
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ABSTRACT

We provide evidence on the distribution of school attendance and educational attainment across African countries, focusing on the correlation with literacy rates in the population, level of resources and country institutional features. We also estimate sample correlations between enrolment and macro-aggregates, related to resources (GDP per capita, student/teacher ratio), computing some counterfactuals. We then move to micro-data, selecting three African countries as representative examples of low (Mauritania), middle (Uganda) and high (Ghana) educational attainment. Using social surveys conducted in these countries, we estimate the returns to education in terms of better quality of employment (for those who are in the labour market) and of higher monetary returns (for the sub-sample of those earning a monetary wage). In addition, we collapse the data at household level, in order to study the determinants of individual educational attainment of children aged between 5 and 25, in order to show the correlation between parental education, availability of schools at community level, external shocks (like drought, famine, war) and the individual probability of being in school.

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EUROPEAN REPORT
ON DEVELOPMENT

1. Introduction

Social protection aims to protect citizens against uninsurable shocks. This is usually achieved through the introduction of contributory funds (such as pensions and unemployment benefits) and through the provision of non-contributory safety-nets, financed through general taxation. The former includes an insurance component, while the latter responds to assistance needs. In the evolution of Bismarkian welfare system, social protection has moved from insurance to assistance, as well as from selective to universal.

Safety-nets represent a significant portion of poverty-reduction strategies, but they may also have an efficiency-enhancing effect. In fact, they do not promote growth per se, but they may have important impacts on the investment choices of families, including the education of their children (Grosh *et al.*, 2008). By lengthening the time horizon of financially constrained families and/or by helping them to cope with risky periods of adverse fortunes, safety-nets may have beneficial effects on the education of children.

The channel through which school attendance is at risk in the face of negative shocks (famine, war, flood, accident or death of household breadwinner, etc) is twofold: families hit by negative shocks tend to reduce all expenditure (including school expenditure, which accounts for a large portion of household incomes[1]) and try to resort to child labour as an additional source of income. In both cases, the likely outcome is a reduction in children school attendance, especially among girls.

This amplifies the long-term impact of adverse shocks, for two reasons. On the one hand, given the high inter-generational persistence in educational attainment, it creates a negative spill-over on future generations. On the other hand, the gender-biased impact of reduction in school attendance has a long-term impact, because greater education for girls has been proven to have a positive impact on the health of infants and children, on immunisation rates and on family nutrition (Bruns *et al*., 2003).

In order to isolate school participation from negative shocks, international agencies put more and more emphasis on conditional cash transfers (Fiszbein and Schady 2009). These transfers condition the release of aid on the use of specific health and education services by the programme beneficiaries. They may be rationalised by the possibility of households under-investing in the human capital of their children (due to either incorrect beliefs about the returns to education, or to "imperfect altruism" between parents and their children and/or "sexual discrimination" among children genders). Conditional cash transfers have been shown to increase enrolments in several studies, mainly conducted in Latin America.[2] In the long run, the increase in the education achieved should lower inequalities in education, thereby lowering inequality in incomes (Grosh *et al*., 2008).

Despite recognising the crucial role of education, most African countries do not have the financial resources to create universal and effective safety-nets (African Union 2008). The recognition of the critical role of education goes back to 1962 when some African countries committed themselves to "*Education for all children by 1980*" in the Addis Ababa Declaration. However, more than 40 years after that declaration, achieving universal education remains a major challenge in Africa. While the Millennium Development Goal considered the achievement of universal education by 2010, at an estimated cost for Africa of 1.9 billion US dollars per year (Bruns *et al.*, 2003), there is now discussion about what might constitute a reasonable target in order to accomplish this goal.

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[1] Between 5 and 20% of total household income, according to Grosh *et al*. 2008, p.15.
[2] See a summary table of existing studies at pg.17-18 of Fiszbein *et al*. 2009.

EUROPEAN REPORT
on DEVELOPMENT

In the present paper, we discuss the relationship between social protection and educational investment in the context of sub-Saharan Africa. This relationship is a complex one, because it has a two-fold nature along an inter-temporal dimension. Let us discuss some of these relationships.

First of all, social protection may be effective in raising school attendance and therefore increasing educational investment, as long as poor households are prevented from doing so by financial constraints. Analysis based upon micro-data confirms that household income is one of the main determinants of school attendance, jointly with parental education and access to education, as measured by the distance to the school (Garcia and Fares 2008, reporting analysis conducted on Burkina Faso and Tanzania).[3] However, school availability has a relatively low impact on raising school attendance, especially when compared to school quality measures, such as the number of students per teacher (Filmer 2007, working on micro-data from 21 poor countries including Benin, Burkina Faso, Central African Republic, Cameroon, Chad, Côte d'Ivoire, Madagascar, Mali, Morocco, Niger, Nigeria, Senegal, Tanzania, Uganda and Zimbabwe). However, the costs of attendance are heterogeneous in the population, varying according to family wealth and child gender (Arnold Lincove 2009, working on micro-data from Nigeria). Family wealth, as proxied by alternative summary measures obtained from durable possession and housing characteristics, reveals itself to be a significant determinant of primary school attendance (Filmer and Prichett 1999, working on DHS surveys for 35 countries).

The second aspect concerns whether educational investment is worth undertaking. Most of the literature agrees about the existence of economic returns associated with education in Africa, related to both higher wages and higher probability of employment. The estimated effects in Africa are in line with those observed in other regions: the average return to an additional year of schooling in sub-Saharan Africa is estimated at about 12 percent (Psacharopoulos and Patrinos 2004). New evidence suggests that returns increase with the level of education and that returns to higher education have been rising (Garcia and Fares 2008). Returns are kept high by the low cost of the attendance of secondary and tertiary institutions, where the offspring of better-educated families are disproportionately represented (Schultz 2004). There are cross-country variations, associated with the level of development (proxied by the GDP *per capita* and/or by life expectancy) and with freedom of economic initiatives (King *et al.*, 2010).

If children from poor families are prevented from schooling by lack of money, and schooling is associated to higher earnings and better employment prospects over the life-span of the children, then raising family incomes through assistance funds represents a form of social protection with regard to children, since it will modify their perspectives with regard to their economic life. In fact, education can be considered as a means to provide permanent social protection for at least five reasons:

- it raises employability, which, in the African context, means raising the transition probability from the informal/subsistence sector to the formal sector;

- it raises individual permanent income/consumption/welfare over the life-span, which may translate into higher wealth/better quality of housing/possession of durables;

- it reduces individual income risk, due to longer employment contract length/reduced unemployment spell/higher pensions;

- due to inter-generational transmission of socio-economic status, by increasing education in one generation, it positively affects all the following generations;

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[3] Income shocks are also important determinants of schooling. Children in Burkina Faso from households experiencing a negative income shock are less likely to enrol in school. The effect is strongest for households in the lowest income quintile. In Tanzania the adult employment rate is negatively correlated with schooling, suggesting that as adults face more problems in the labour market, school enrolment of their children also declines.

EUROPEAN REPORT on DEVELOPMENT

- due to positive correlation between growth and human capital accumulation, increased educational attainment in the population raises output growth, which, in turn, represents a powerful engine to draw people out of poverty.[4]

In the present paper, we provide additional support to this claim, by studying educational attainment in African countries both at the macro and at the micro level. We provide macro-evidence on the existing school participation in all the African countries that we were able to collect information about, showing the correlation between school enrolment and literacy rates in the population. We also estimate sample correlations between enrolment and macro-aggregates, related to resources (GDP *per capita*, student/teacher ratio), computing some counterfactuals. We then move to micro-data, selecting three African countries as representative examples of low (Mauritania), middle (Uganda) and high (Ghana) educational attainment. Using social surveys conducted in these countries, we estimate the returns to education in terms of better quality of employment (for those who are in the labour market) and of higher monetary returns (for the sub-sample of those earning a monetary wage). In addition, we collapse the data at household level, in order to study the determinants of individual educational attainment of children aged between 5 and 25, in order to show the correlation between parental education, the availability of schools at community level, external shocks (such as drought, famine, and war) and the individual probability of attending school. Policy implications are discussed in the conclusions.

2.   Aggregate evidence on school participation

One of the main problems when aiming to aggregate studies on Africa is the lack of data, not to mention their quality and comparability over time. Table 1 provides the best of the comparable recent information that we were able to collect for the entire continent. The overall picture suggests that the two extremes, the Northern and Southern regions, are better endowed than the rest of the continent in terms of school participation, with the former well ahead in terms of secondary and tertiary education. Western Africa is the region where school attendance seems problematical, even if it could simply be lagging on the same scholarisation path previously experienced by other countries. This trend is well summarised in Table 2: in the last decade, most of the countries achieved almost full participation in primary education (which now scores at 100% in terms of gross rates and at 78% in terms of net rates).[5] Secondary school participation also increased by 12 percent points, while tertiary education is stagnating at a dramatic level below 4%.

The overall picture is well summarised by Figures 1 to 3, which plots the country distribution according to the (gross) enrolment rates available at the end of the current decade. From Figure 1, it clearly appears that the limited access to primary education is mainly concentrated in the sub-Saharan region (downward extending to Congo Democratic Republic). Since education is a vertically integrated process, a shortage of primary educated pupils lowers enrolment rates at secondary level, which may remain low for additional reasons as well (see the case of Angola and Mozambique in Figure 2). Finally, tertiary education is limited in almost all countries, with some notable exceptions given by all North African countries, South Africa and Liberia (see Figure 3). What is sometimes called the "poverty belt" is also an "**illiteracy belt**", constituted by the countries at the bottom of the country rankings by enrolment rates: <u>Burkina Faso, Niger, Chad, Sudan and Central African Republic</u>.

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[4] Oketch 2006 shows that the relationship between economic growth and educational attainment is more complex, considering the spillover on physical capital accumulation and concluding that the sources of labour productivity growth in the medium term in African countries are high investment in physical capital and in human capital.

[5] Gross rates are computed by taking the ratio between students enrolled in a given school level and the corresponding population in the relevant age, while net rates restrict the denominator to the students in the relevant age. Grade repetition raises gross rates, but not net ones.

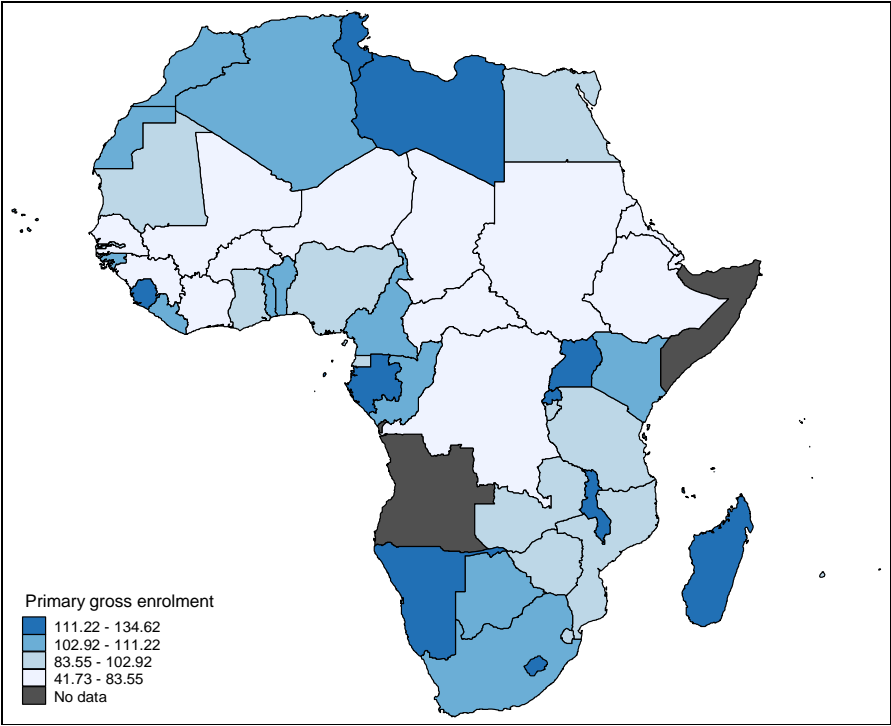**Figure 1 – Primary gross enrolment – Africa 2010**

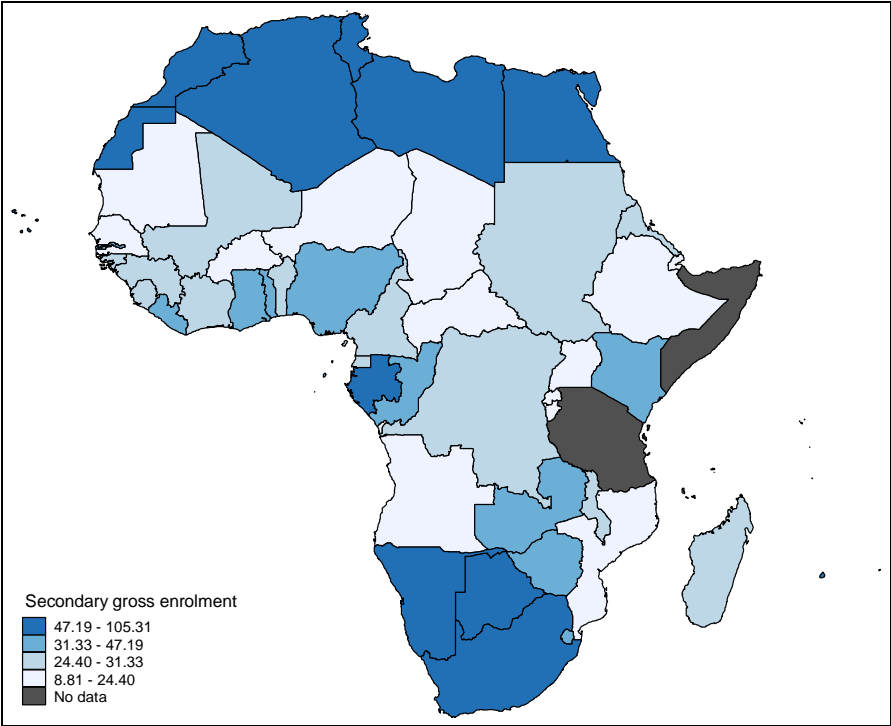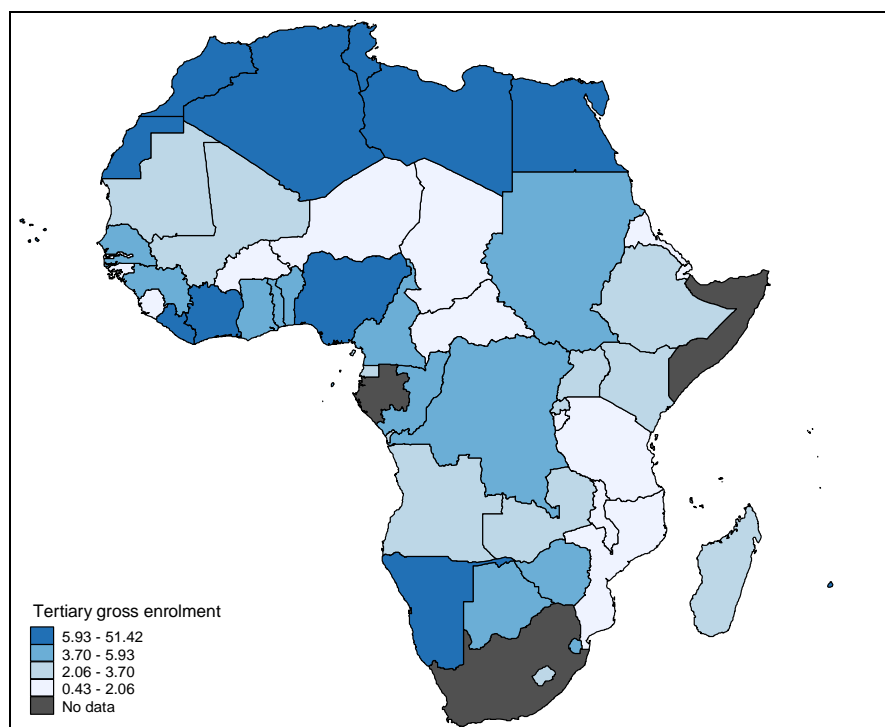**Figure 2 – Secondary gross enrolment – Africa 2010**

Figure 3 – Tertiary gross enrolment – Africa 2010

Table 1 – Literacy rates and school participation – Africa mid 2000's

Country	Adult literacy rate	Primary gross enrolment	Secondary gross enrolment	Tertiary gross enrolment
Northern Africa	**68.66**	**104.66**	**69.05**	**23.91**
Algeria	71.26	109.51	80.52	20.25
Egypt, Arab Rep.	68.89	96.30	77.74	29.76
Libya	87.30	111.74	103.34	51.42
Mauritania	54.00	94.55	22.40	3.31
Morocco	54.35	103.96	47.19	11.00
Tunisia	76.15	111.90	83.13	27.70
Central Africa	**68.93**	**99.03**	**30.58**	**3.60**
Cameroon	72.15	104.88	29.16	5.80
Central African Republic	51.59	69.22	11.9	1.74
Chad	29.86	75.46	15.15	1.28
Congo, Dem. Rep.	66.88	72.62	27.68	4.55
Congo, Rep.		107.38	38.66	4.42
Equatorial Guinea	89.99	99.45	27.4	3.26
Gabon	85.40	134.62	51.29	7.05*
Sao Tome and Principe	86.60	128.59	43.45	4.14
Eastern Africa	**67.54**	**92.63**	**34.78**	**2.62**
Burundi	62.60	93.0	13.4	2.03
Comoros	71.00	120.2	41.4	2.22
Djibouti		41.7	21.0	1.66

EUROPEAN REPORT DEVELOPMENT

Eritrea	58.90	61.3	28.4	1.55
Ethiopia	35.90	76.6	24.3	2.55
Kenya	80.10	103.9	47.2	3.16
Rwanda	67.60	129.7	16.0	2.68
Seychelles	91.80	113.7	105.3	nd
Sudan	65.10	57.5	31.1	5.93
Tanzania	71.00	96.8	5.74*	1.19
Uganda	71.40	124.4	19.7	3.25
Western Africa	**44.59**	**88.82**	**31.53**	**5.22**
Benin	37.73	103.33	31.27	5.57
Burkina Faso	23.98	57.77	13.89	1.94
Cape Verde	82.45	110.70	67.11	6.46
Côte d'Ivoire	51.67	72.65	24.51	7.32
Gambia, The	41.06	88.74	45.11	1.17
Ghana	61.85	88.29	45.26	5.58
Guinea	29.48	78.80	27.39	4.26
Guinea-Bissau	46.18	106.25	27.36	1.53
Liberia	56.00	103.82	33.47	17.39
Mali	25.09	76.44	25.58	3.45
Niger	19.03	46.99	8.81	1.03
Nigeria	57.44	96.65	31.39	9.77
Senegal	40.58	76.40	21.87	5.77
Sierra Leone	37.31	117.53	30.54	2.06
Togo	59.03	107.96	39.36	4.99
Southern Africa	**78.25**	**108.59**	**46.46**	**4.26**
Angola	68.50	81.37*	15.88	2.45
Botswana	82.24	108.25	77.68	4.65
Lesotho	87.88	113.52	35.52	2.97
Madagascar	70.68	131.21	26.04	2.80
Malawi	72.80	122.94	28.93	0.43
Mauritius	85.90	100.03	84.18	14.66
Mozambique	51.08	95.55	12.46	1.19
Namibia	86.62	113.77	63.79	6.81
South Africa	89.00	105.46	91.17	14.65*
Swaziland	83.03	99.59	45.9	4.58
Zambia	69.92	102.5	34.84	2.40
Zimbabwe	91.40	101.64	41.11	3.95

*Source: Barro-Lee 2010 + Unesco website – * referred to 2000*

EUROPEAN REPORT on DEVELOPMENT

Table 2 – School participation – Africa 2000

Year	Primary gross enrolment	Secondary gross enrolment	Tertiary gross enrolment
2000	83.36 (43)	26.81 (40)	3.30 (36)
2005	92.34 (45)	33.64 (44)	3.59 (39)
2010	102.07 (44)	39.61 (38)	4.53 (34)
Average decade	92.66	33.26	3.79

Source: Barro-Lee 2010 + Unesco website – number of observations in brackets

While enrolment rates represent flow measures, they obviously reflect stock measures of human capital. In Table 3, we report the adult population distribution by educational attainment, separating those who have completed a degree from those who have attended only some years of schooling. These variables (which, over the last decade, account for an average of 15% in primary education, 17% in secondary and 2% in tertiary education) could be taken as proxy measures of drop-out rates during the schooling experience.[6] Overall, the African educational system has significant leakages, which can be grasped by looking at Figure 4. This graph plots the population distribution without education or with an attained degree: the distance from 100% represents the portion of the population of those who aimed to obtain a higher degree without attaining it. For some countries (notably Congo Republic, Senegal and Zimbabwe), this waste of education exceeds 60%! At the other extreme, some countries (Benin, for example) exhibit a very fluid educational system, even if this may be due to a large portion of the population not attending school (as in the case of Niger).

Data on population distribution reflect a very static view, because it takes more than a generation to change the educational attainment in a population. For this reason, in Table 4, we resort to literacy rates, making a distinction between the young population (aged 15-24) and the entire population. Here, the increase in the population attending school is sizeable, with an increase of more than one percentage point per year in the portion of the population capable of reading and writing. Adopting the alternative standard measure of the average years of education in the population, we notice a trend increase of approximately one year of schooling every eleven years. Proceeding at this speed, Africa, as a whole, would catch up with the current values for Europe (10.3 years of schooling) in 43 years. Despite this, looking at Figure 5, we observe that sub-Saharan Africa is performing better than South Asia, in terms of human capital accumulation, with an acceleration in the last decades of the previous century, and signs of more recent slowing down.

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[6] However in some cases this coding procedure account for cross-country differences in institutional design. Whenever a country system includes lower secondary and upper secondary schools, the completion of the former will be considered as "some secondary school attained".

EUROPEAN REPORT ON DEVELOPMENT

Table 3 – Measures of educational attainment: formal schooling – Africa 2000

Year	% pop wth no schooling	% pop wth some primary education	% pop wth primary completed	% pop wth some secondary education	% pop wth secondary completed	% pop wth some tertiary education	% pop wth tertiary education
2000	39.80	15.85	16.55	15.38	9.46	1.53	1.42
2005	35.96	15.24	17.79	16.78	10.59	1.86	1.77
2010	32.27	13.69	19.89	18.66	11.03	2.26	2.19
Average	36.01	14.93	18.08	16.94	10.36	1.89	1.79

Source: Barro-Lee 2010 – data referred to 38 countries

Table 4 – Measures of educational attainment: adult literacy and years of education – Africa 2000

Year	literacy rate youth 15-24	literacy rate entire population	average years of education
2000	56.28 (8)	47.13 (8)	4.71 (37)
2005	71.20 (47)	59.38 (47)	5.15 (37)
2010	77.84 (47)	66.46 (47)	5.58 (37)
Average decade	73.09	61.68	5.15

Source: Barro-Lee 2010 + Unesco website – number of observations in brackets

EUROPEAN REPORT
DEVELOPMENT

Figure 4 – Completed educational attainment – Africa 2010
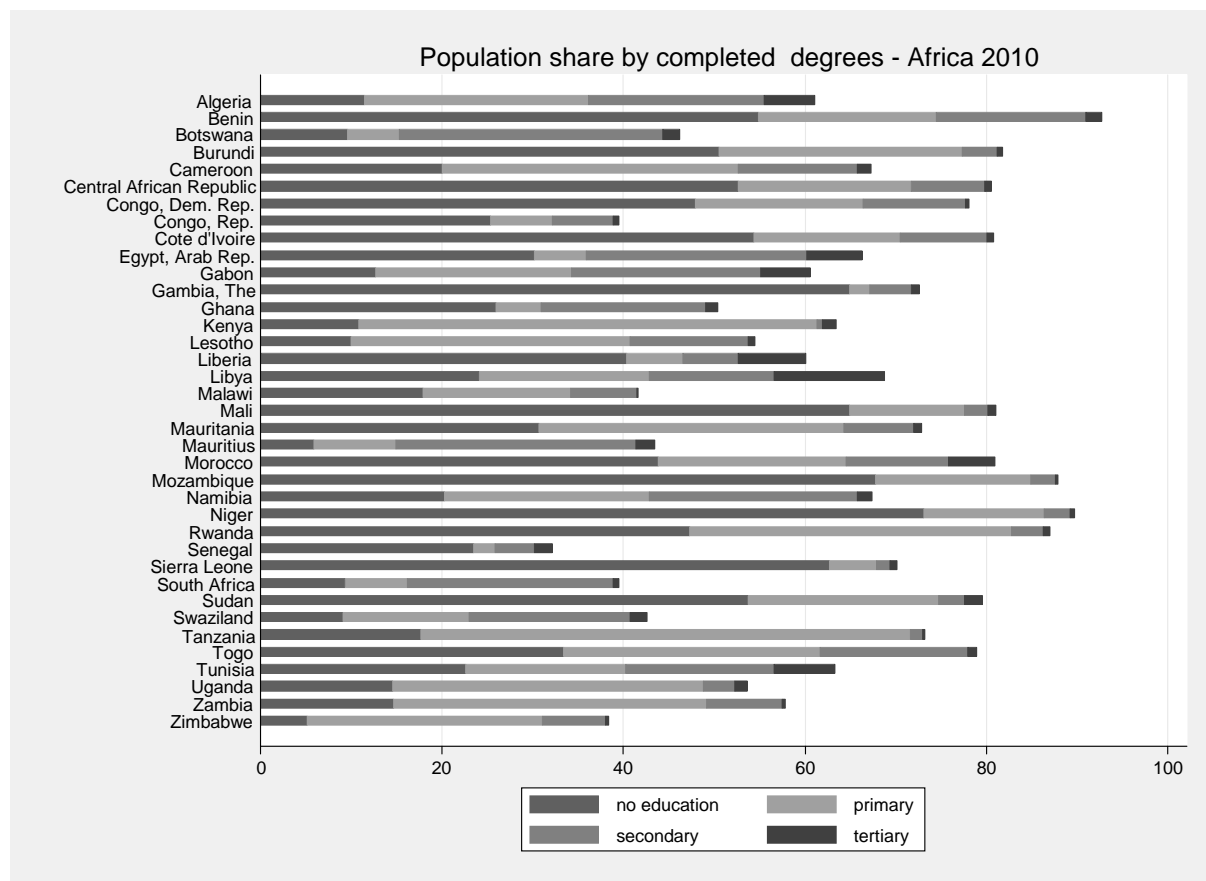
Figure 5 – Average years of education – World 1950-2010

source: Barro-Lee 2010
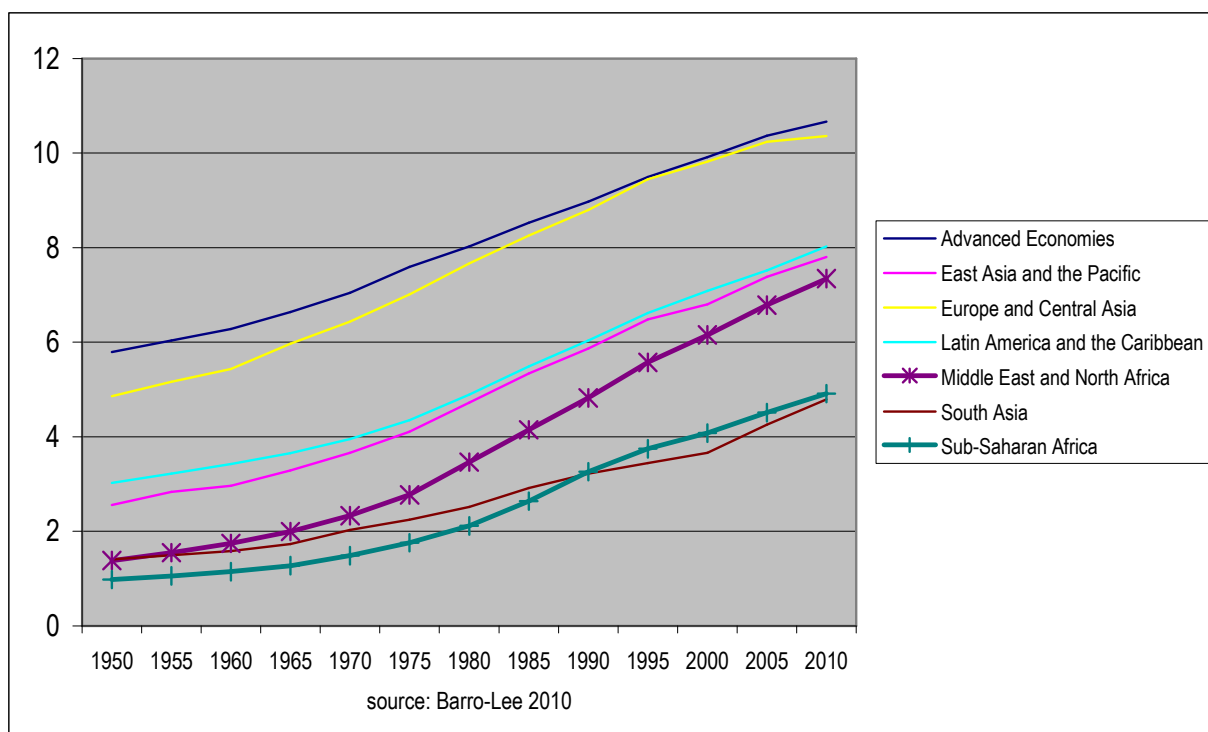
Table 5 – Resource indicators – Africa 2000

Year	pupil-teacher ratio - primary	pupil-teacher ratio – secondary	Public spending on educ as % GDP
2000	42.10 (48)	23.72 (42)	4.17 (45)
2005	42.44 (49)	23.79 (44)	4.32 (39)
2010	42.46 (49)	25.31 (38)	4.67 (38)
Average 2000-10	42.33	24.23	4.37

Source: Barro-Lee 2010 + Unesco website – number of observations in brackets

On average, African countries are continuing to invest resources in the attempt to foster this growth of human capital. This is clearly perceivable from Table 5, where the rising enrolment in both primary and secondary education shows a corresponding rise in the number of teachers, keeping the student/teacher ratio almost constant. Similarly, financial resources invested in education (as a fraction of GDP at constant prices) exhibit a weakly rising trend.

A final image is offered by Figure 6, which depicts the country distribution in terms of the literacy rate of the young population. As we have already mentioned, the sub-tropical regions are characterised by a literacy rate in the adult population which is comparable to that of the developed countries, and Eastern Africa is following a similar lead (with the exception of Ethiopia). In contrast, most of the Western African countries maintain their disadvantage in terms of population reading and numeracy capabilities, with all the known implications in terms of under-development in the economic and political life.

EUROPEAN REPORT ON DEVELOPMENT

Figure 6 – Youth literacy rate – Africa 2000
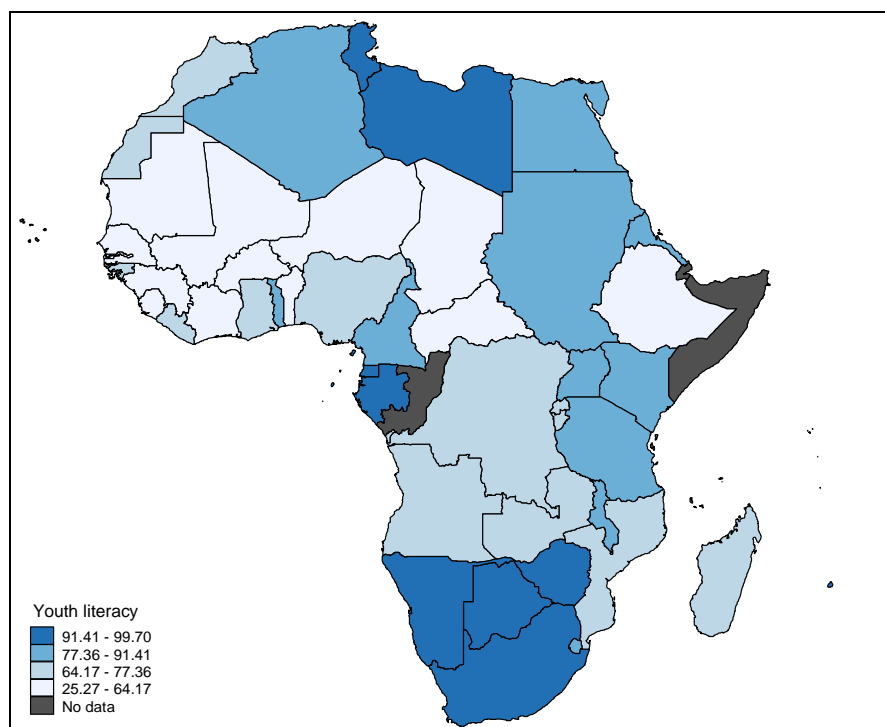
We now move to regression analysis, in order to dis-entangle the multivariate nature of the existing correlations. In Table 6, we estimate five different models that account for the dynamics of enrolment rates, disaggregated by educational level. Despite averaging over five years in order to minimise the problem of missing data, the dataset consists of an unbalanced panel with a maximum of three data points per country (2000, 2005 and 2010). With a potential sample size of 162 observations, we work with an average of less than one hundred observations. Each equation includes regional and year dummies to control for remaining heterogeneity; errors are clustered by region and year.

In columns 1-3, we start with our basic model, controlling for the (log of) GDP *per capita* at 2000 prices. This variable exhibits positive correlations in all specifications, with a semi-elasticity ranging between 8.7 and 15.1 for primary enrolment, from 15.4 to 25.4 for secondary enrolment, and from 3.9 to 5.1 for tertiary enrolment. Taking midpoint estimates, they correspond to an estimated elasticity of 0.12 for primary enrolment, 0.55 for secondary enrolment and 0.38 for tertiary enrolment.[7] Since we may presume that GDP is pre-determined with regard to school enrolment, these results suggest that GDP growth promotes schooling, possibly alleviating liquidity constraints (as can be presumed by noticing that the elasticity is highest in the school level which is growing the most). We also control for the territorial distribution of the population, using both population density and either the fraction of population in rural areas (which is never significant) or the fraction of GDP produced in agriculture. The absence of significant correlations with both population density and population in rural areas would suggest that schooling is not prevented by difficult accessibility; quite the opposite is true: countries with a larger portion of GDP produced in agriculture are, on average, poorer than the rest, and nevertheless, if all other things are constant, they tend to have higher enrolment rates.

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[7] They are respectively computed as (15.1+8.7)/(2*92), (15.4+25.4)/(2*37) and (3.9+5.1)/(2*5.8), using mean enrolments in the sample.

EUROPEAN REPORT
DEVELOPMENT

We aim to check for the institutional framework by means of two variables, a direct measure of the quality of institutions provided by the Index of African Governance,[8] and the historical inheritance coming from the identity of past colonisers. The former variable is always positively correlated to school enrolment, indicating that a safer, just and stable political environment allows an increase child education. With regard to past colonisation, there is positive correlation of schooling with the past British domination, while a weak correlation emerges for Belgium (positive) and France (negative).[see page 18] All other dummies (controlling for other colonisers, single or combined) do not emerge as significant. Despite the fact that colonisation ended in the continent almost forty years ago, it is possible that the infrastructure built during domination may support current efforts for education.

The role of the available resources is controlled in the second model (columns 4 to 6), in which we find positive correlation with student/teacher ratios for primary and secondary enrolment (a similar variable is not available for tertiary education, and is proxied by public expenditure in education). If student/teacher ratio is taken as a proxy for school quality (as in the education literature for developed country - see Glewwe and Kremer 2006), we would get the counter-intuitive result that enrolment is growing where quality is declining. We prefer a different explanation, based upon the idea that countries which press for expanding education do it at the cost of increasing the size of the classes, thus increasing the number of students per teacher. Thus, we interpret these positive correlations as a sign of teacher shortage rather than an indication of a decline in the quality of schooling. However, this result is robust under most specifications, for both educational levels (primary and secondary) as it draws our attention to the issue of the quality of education provided in some of these countries, where the number of students per teacher can be as high as 90 for primary schools (Malawi in 2010) (Filmer 2007). In contrast, financial resources invested in education emerge as not significant in all models estimated adopted in Table 6.

In the third model (columns 7 to 9), we would like to control/check for the cultural environment. In order to minimise the loss of observations, instead of using data on literacy rates (to be analysed below), we use the portion of population without any educational attainment. This variable (which is pre-determined by construction) exerts a negative impact on primary and secondary schooling, also absorbing the correlation with the quality of governments. A favourable interpretation suggests that most of the quality of institutions lies in the educational attainment of their populations.

In the fourth model (column 10 to 12), we would like to check whether schooling is negatively associated with poverty. Despite halving the sample size, there is some indication in the data that poverty is negatively correlated with secondary school enrolment, but these results are not strictly comparable with the previous results. Finally, the fifth model (columns 13 to 15) exploits the panel structure of the data by fitting them into a random effect model. Most of the previous results hold even in this framework, which suggests that they are rather robust.

As a way of summary, we could say that school enrolment in Africa in recent years, especially at primary and secondary level, seems to be affected by:

➢ the availability of income (as indicated by GDP *per capita* and – when available - by poverty rates);

➢ past educational attainment in the population;

➢ the stability and safety of the environment, assured by the quality of governance;

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[8] The most recent value available is 2007, which is used for all years (to be replaced in 2000 and 2005 by closer values when available). It summarise the scores on "Safety and Security", "Rule of Law, Transparency, and Corruption", "Participation and Human Rights", "Sustainable Economic Opportunity" and "Human Development". See http://www.nber.org/data/iag.html. See also Kaufmann *et al*. 2009.

➢ the availability of educational resources (as teachers and infrastructures).

In Table 7, we now consider the determinants of literacy rates in the population, either in its young component (15-24 years old) or in its entirety. Once again, we find positive correlation with the stage of development proxied by the GDP *per capita*, but here the interpretation should be cautious, since reverse causality may be an issue. In this framework, rural societies (again proxied by the share of agricultural product in the GDP) do not seem to be prevented from achieving a high level of literacy. An interesting result emerges when the geographical shape of the territories are considered. While population density is not significant (not reported), countries without access to the oceans have coeteris paribus a lower level of literacy. Past colonisation indicates that British and Belgian domination favoured educational achievement, while it is statistically insignificant for the French domination. What seems to matter for literacy is the financial effort captured by the share of public expenditure in education, but, once again, we must be aware of potential reverse causality. All these results still hold when we go to a random effect model in columns 5 and 6.

However, macro-analysis reports "average" forms of behaviour, which are informative about the size of the phenomena as well as of their temporal variations, but they do not help us to identify who the children more at risk of school absence are. For this reason, we complement this aggregate view with the investigation of household representative surveys for three African countries.

EUROPEAN REPORT
DEVELOPMENT

Table 6 - Determinants of gross enrolment rates – Africa 2000-2010 - OLS

	1 primary	2 secondary	3 tertiary	4 primary	5 secondary	6 tertiary	7 primary	8 secondary	9 tertiary	10 primary	11 secondary	12 tertiary	13 RE primary	14 RE secondary	15 RE tertiary
log of GDP per capita (constant 2000 US$)	8.74	20.436	5.099	15.139	21.856	3.966	12.688	22.988	4.873	4.97	25.463	5.065	9.988	15.499	3.95
	[2.58]***	[9.32]***	[3.01]***	[3.36]***	[11.26]***	[3.42]***	[2.12]*	[10.41]***	[2.82]***	[1.23]	[12.31]***	[2.82]*	[1.74]*	[4.46]***	[3.62]***
Population density (people per sq_km)	0.021	-0.01	0.004	0.014	-0.011	0.005	0.006	-0.011	0.005	0.199	0	-0.003	0.029	0.012	0.007
	[0.65]	[1.27]	[0.90]	[0.46]	[1.28]	[1.25]	[0.32]	[1.06]	[0.89]	[10.73]***	[0.01]	[0.33]	[0.53]	[0.63]	[1.47]
Agriculture % of GDP	0.548	0.467	0.143	0.692	0.598	0.085	0.352	0.607	0.069	0.397	0.937	0.134	0.212	0.442	0.075
	[2.85]***	[3.97]***	[2.54]*	[3.17]***	[4.64]**	[2.05]*	[0.82]	[3.37]**	[0.93]	[1.85]*	[4.79]**	[2.00]*	[0.66]	[3.98]***	[1.97]*
Index African Governance 2007	0.568	0.314	-0.123	0.544	0.416	-0.07	0.157	0.115	-0.083	0.597	0.622	-0.053	0.647	0.561	-0.083
	[3.75]***	[2.53]*	[2.36]*	[4.50]***	[2.78]**	[1.81]*	[0.74]	[0.51]	[1.89]*	[2.11]*	[4.19]**	[0.69]	[2.23]*	[2.09]*	[1.70]*
Colonizer: Belgium	2.546	10.079	3.297	8.039	16.036	2.491	4.835	24.287	4.508	-22.351	18.013	6.643	3.953	3.135	2.606
	[0.28]	[1.44]	[1.36]	[1.00]	[1.93]*	[1.33]	[0.50]	[3.28]***	[1.09]	[2.84]**	[1.57]	[3.66]***	[0.26]	[0.33]	[1.04]
Colonizer: Britain	1.741	10.63	2.311	4.395	12.104	3.603	-7.37	10.767	4.964	8.833	8.058	4.511	2.396	10.354	3.629
	[0.46]	[3.34]***	[1.83]*	[1.10]	[3.04]***	[2.25]*	[1.21]	[3.18]***	[1.55]	[0.92]	[1.48]	[1.83]*	[0.40]	[2.20]*	[2.28]*
Colonizer: France	-3.146	-2.764	-0.369	-4.216	-1.129	1.474	-20.678	-8.804	2.106	4.751	-3.828	1.419	-10.167	-2.957	2.004
	[0.74]	[0.88]	[0.31]	[0.77]	[0.28]	[1.55]	[3.52]***	[1.84]*	[1.02]	[0.55]	[0.90]	[1.04]	[1.28]	[0.57]	[1.24]
Pupil-teacher ratio, primary				0.54			0.869			0.211			0.658		
				[2.72]**			[4.06]***			[1.11]			[3.09]***		
Pupil-teacher ratio, secondary					0.39			0.641			0.249			0.276	
					[2.82]**			[2.64]**			[1.39]			[2.51]**	
Public spending on education (% GDP)						-0.02			-0.005			-0.392			-0.014
						[0.20]			[0.04]			[1.67]			[0.13]
Poverty headcount ratio at $1.25 a day (PPP)										-0.002	-0.237	-0.047			
										[0.01]	[3.56]***	[1.13]			
Percentage of No Schooling in Population							-0.661	-0.266	0.029						
							[6.78]***	[4.91]**	[0.88]						
Observations	144	134	122	140	119	101	102	86	73	69	60	56	140	119	101
R-squared	0.4	0.81	0.67	0.43	0.81	0.69	0.48	0.85	0.7	0.65	0.9	0.73	0.4	0.78	0.69
Log likelihood	-632.24	-505.81	-355.08	-609.9	-445.49	-274.43	-428.87	-307.55	-205.71	-280.48	-206	-155.76			
Number of _ID	51	51	50	50	49	45	36	35	33	39	38	32	50	49	45

*Robust t statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% robust errors clustered by region+year – constant, region and year controls included*

EUROPEAN REPORT ON DEVELOPMENT

Table 7 - Determinants of literacy rate – Africa 2000-2010 - OLS

	1	2	3	4	5	6
	youth	adult	youth	adult	RE youth	RE adult
log of GDP *per capita* (constant 2000 US$)	9.781	10.522	7.863	8.878	7.03	6.262
	[4.66]***	[4.75]***	[4.82]***	[4.37]***	[3.53]***	[2.69]***
Agriculture % of GDP	0.116	0.139	0.061	0.08	0.118	0.116
	[1.21]	[1.38]	[0.35]	[0.48]	[1.09]	[0.97]
Landlocked	-6.783	-5.462	-10.621	-7.612	-11.103	-10.672
	[2.56]**	[2.04]*	[3.85]***	[2.44]**	[2.56]**	[2.46]**
Coloniser: Belgium	9.748	14.958	10.834	12.184	10.7	11.698
	[2.03]*	[3.19]***	[1.51]	[2.14]*	[1.58]	[1.55]
Coloniser: Britain	7.547	7.286	6.777	6.826	6.512	6.436
	[1.85]*	[1.96]*	[1.39]	[1.42]	[1.30]	[1.16]
Coloniser: France	-6.293	-4.417	-5.076	-1.933	-7.217	-4.73
	[1.20]	[0.98]	[1.05]	[0.35]	[1.13]	[0.73]
Public spending on education (% GDP)			2.476	2.273	1.466	0.951
			[3.58]***	[3.63]***	[2.30]**	[2.06]**
Observations	97	97	72	72	72	72
R-squared	0.71	0.75	0.76	0.78	0.74	0.74
Log likelihood	-368.51	-361.44	-270.9	-266.69		
Number of countries	49	49	41	41	41	41

*Robust t statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% robust errors clustered by region+year – constant, region and year controls included*

3. Micro evidence on returns to education and school participation in selected countries (Ghana, Mauritania, Uganda)

We have selected three sub-Saharan countries, which aims to be representative of this sub-continent. We have selected them mainly according to their level of educational attainment, not neglecting their different colonial experience. From Table 8, we notice that, despite a similar *per capita* income and a common past of British domination, Ghana has attained a higher level of educational attainment than Uganda, thanks to higher school participation at secondary and tertiary levels. In contrast, Mauritania, a former French colony, exhibits the lowest literacy rate, since most of the population still only receives primary schooling (as witnessed by the gross enrolment rates exceeding 100%).

EUROPEAN REPORT ON DEVELOPMENT

Table 8 – Descriptive statistics on selected countries – means 2000-10

Country	GDP *per capita* (2000 US dollars)	literacy rate young population	gross enrolment rate primary	gross enrolment rate secondary	gross enrolment rate tertiary
Ghana	272.36	74.98	84.27	42.31	5.58
Mauritania	433.36	64.17	89.99	20.66	3.94
Uganda	272.86	84.05	117.88	16.53	2.81

Country	% pop with no schooling	% pop with primary education	% pop with secondary education	% pop with tertiary education	years of education
Ghana	28.96	8.12	61.35	1.66	7.46
Mauritania	38.47	46.40	13.38	1.77	4.06
Uganda	19.77	67.30	9.82	3.12	4.85

Source: Barro-Lee 2010

For each of these three countries, we gained access to micro-data obtained from household surveys, which allowed us to investigate educational choices and labour market returns. The main objective of household surveys is to collect data on the socio-economic characteristics of a country's household population. The topics covered by the surveys are the demographic characteristics of the population, education, health, employment and time use, migration, housing conditions, household consumption, household income and household assets. Some surveys also include a community questionnaire in which information is collected at community level about the supply of a number of public goods, such as schools, sanitary services, transportation, markets, etc. Among the three countries taken into consideration, both the Uganda and the Ghana survey have a community questionnaire, although, in the Ghana survey, because of an unfortunate limitation in the design of the survey, the community data cannot be matched with household level information.

The Uganda National Household Survey (UNHS) 2005/06, is a sample of 7,426 households (almost 43,000 individuals) collected from May 2005 to April 2006. The Ghana Living Standards Survey-Round Five (GLSS 5) was carried out between January 2005 and August 2006 and covered 8687 households (for a total of 37,128 household members). For Mauritania, the Continuous Survey on Household Living Conditions (EPCV) 2000 survey collected a sample of 5,964 households, for a total of over 40,000 individuals between August 2000 and 2001.

All of the three surveys are nationally representative samples selected through a two-stage stratified clustered sampling method using Census data as the sampling frame. For our purposes, the relevant sections are those regarding:

1. household demographic composition – in which information on age, gender, and position in the household are collected;

2. individual education – collecting information on the number of years of school attended and the highest level of education attained by each individual in the household aged 5 or over;

3. occupation, in which information is obtained for the occupational status of each individual over 15 and the individual wage.

EUROPEAN REPORT on DEVELOPMENT

Information at household level is also used and matched to each individual in the household, to measure housing characteristics, such as distance from the main water source or the type of roof on the house, and the total household consumption per adult equivalent. Total household consumption per adult equivalent is an aggregate provided by the statistical office that takes the household's overall annual expenditure on food items, non-food items, consumer durables, and housing into account.[9] The overall value of the household's consumption is then adjusted for the cost-of-living differences within each country and for the household's composition. While the questionnaires are substantially comparable, there are a few differences that should be pointed out. The first divergence concerns differences in each country's educational system, which translate into different degrees. The following common categories have, however, been identified in each survey: no schooling, partial primary schooling, completed primary, junior secondary, senior secondary, post-secondary vocational education, college/university or higher. The number of years of education necessary to obtain each degree differs slightly; for this reason, the analysis also looks at the number of years of school completed at the time of the survey.

When comparing macro-data in Table 8 with individual statistics from micro-data in Table 9, we see that country rankings are retained, despite with different averages in the years of education. Figure 7 plots the actual school attendance in our dataset, reporting the fraction of individuals coded as students (without knowing the level of school attended). According to this graph, Ghana begins schooling quite early (school attendance is 76% at the age of 5),[10] while Uganda is characterised by higher attendance at the later stages of secondary school. It is rather surprising to record that Mauritania registers a school participation rate above 20% in the age range 20-25 (though we ignore the type of school attended).[11]

The second divergence concerns occupational categories, which are also different. In the Uganda and the Ghana datasets, the following categories are provided: unpaid family worker, self-employed (own-account workers, OECD), employer, private employee, government employee. In the Mauritania dataset only four occupational groups could be identified: unpaid family worker, self-employed, private employee, and governmental employee. The self-employed group, in this case, includes both employers and self-employed – two groups that have different characteristics and usually have significantly different incomes.

Table 9 – Descriptive statistics from household surveys – population 15-60 - 2000-05

	observations	years of education	primary	junior secondary	senior secondary	vocational/ post-secondary	degree
Ghana	18,186	8.304	18.3%	34.4%	2.8%	3.7%	2.3%
Mauritania	17,648	3.170	12.6%	8.1%	4.7%	0.1%	2.9%
Uganda	17,221	6.199	12.6%	13.0%	1.8%	4.4%	0.9%

Source: see text

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[9] Durables and housing items are included according to a value of service criterion rather than according to the actual expenditure criterion.

[10] This partially contradicts White 2005, who claims that microdata for Ghana require postponing the age of school attendance when making comparison between administrative data on enrolment and household surveys.

[11] This data is mostly driven by the urban population, and possibly reflect class repetition due to failures.

Figure 7 – Population distribution by school participation – 2000-2005
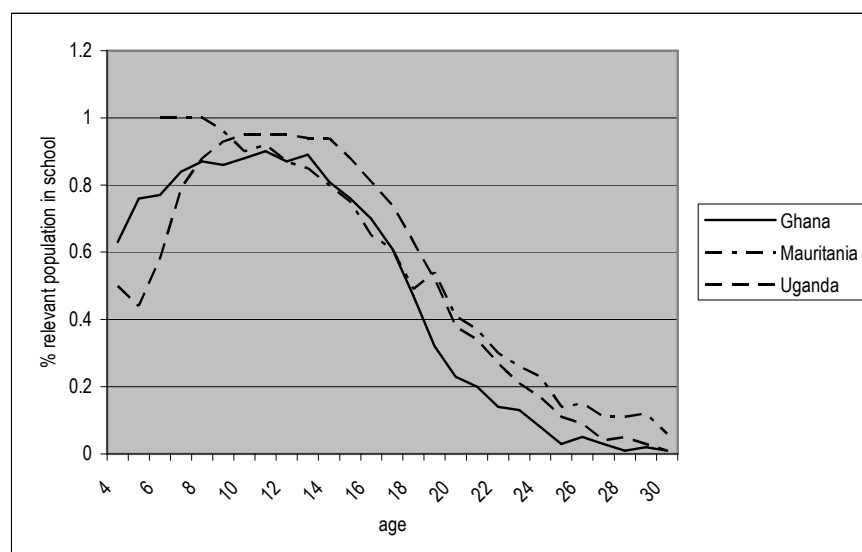
3.1. School participation

We start by studying what makes people attend school. Using micro-data from the household survey provides a better picture of actual school participation, when compared with macro-data which are based upon administrative sources (White 2005). By knowing the actual condition of each family member, we may restrict the sample to the young component and study the family characteristics which are potentially correlated with the probability of still attending school. Clearly, we do not have precise information about the type of school attended, nor whether each boy or girl is actually attending school (or check questions of whether he or she attended school last week), but we take the question "Is … still in school?" as an indication of current attendance.[12] In Tables A.1-A.2-A.3, in the Appendix, we report the estimation of a full model of variables that could be associated to school participation. The most important results are summarised in Table 10.

Males consistently have a higher probability of attending school, the probability being higher wherever the average enrolment rates are lower. However, the crucial issue is whether income prevents children from attending school. The results are mixed. In Ghana, *per capita* consumption (acting as a proxy for family wealth – additional proxies, such as the materials used for roofs, do not show consistent results) - does not show a significant correlation with the probability of enrolment, though some negative correlation emerges with low-income jobs. In contrast, the same country shows much stronger correlation of the probability of child enrolment with parental education (especially with regard to the literacy of the mothers). At the other extreme, we have the case of Mauritania, where we find consistent indications of a scarcity of resources being negatively associated with school enrolment: in addition to *per capita* income showing the biggest marginal effect, there is also a positive association with the head of the household working as a public employee, which is typically associated with less volatile and higher earnings. Conversely, in the case of Mauritania, cultural resources seem less

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[12] This is the form of the question for Ghana. In the case of Uganda it takes a slightly different form: "Have you ever attended any formal school? ….3= Currently attending school" In the questionnaire for Mauritania the question is "… fréquentet-il/elle l'école moderne actuellement ?".

dependent on parental education (except in the case of a father or mother with a college degree). The situation of Uganda is somehow intermediate, because both family financial resources and parental education matter for the schooling of children. The co-efficients of both father and mother education show a favourable increasing trend, suggesting an increasing in the pressure to educate offspring.

It is important to note that, in the case of Uganda, we have information about the source of household income: here, we are able to show that, when the main source comes from "transfers", this helps to increase school attendance. In order to maintain comparability across the three samples, we have proxied the relative isolation of the community by using the (log of the) time to collect water from the main source (in minutes), which, however, does not emerge as being statistically significant in any of the samples.[13]

Table 10 – Average marginal effect on the probability to be enrolled in school – population aged 4-25

|	Ghana 2005	Mauritania 2000	Uganda 2005
Observations	1905	4184	5008
urban	0.064*	0.183	-0.009
male	0.042***	0.126*	0.074***
Log real per adult equivalent household consumption	0.001	0.185**	0.063***
number family members	0.005	0.024***	0.014***
father education==primary	0.070**	-0.114	0.032
father education==middle/junior secondary school	0.043**	-0.018	0.035*
father education==senior secondary school	0.079**	0.249	0.095***
father education==training college	0.143**	0.435*	0.109***
father education==tertiary	0.107	0.716***	0.119*
mother education==primary	0.099***	-0.191*	0.016
mother education==middle/junior secondary school	0.081***	-0.080	0.026
mother education== senior secondary school	0.009	-0.499**	0.056*
mother education==training college	-0.027	0.141	0.139**
mother education==tertiary	0.050	1.000	0.028
socio-economic group==Public	0.034	0.375**	1.000
socio-economic group==wage private formal	-0.169***	0.029	0.0159
socio-economic group==Wage private informal	-0.109**	na	na
socio-economic group==Self-agro-export	0.056	0.145	0.052
socio-economic group==Self-agro-crop	-0.102**	1.000	0.047
socio-economic group==Self-business	-0.070	0.030	0.032
socio-economic group==family workers and others	na	-0.252	na
socio-economic group==unemployed	na	0.002	na
earnings source==transfers	na	na	0.161***
Average log time to collect water from main source, minutes	-0.005	0.002	-0.004

*significant at 10%; ** significant at 5%; *** significant at 1%*
Age, age squared and constant included as additional controls

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[13] We have however information about the actual distance between local community and the nearest primary or secondary school, either public or private, for Uganda. In such a case the distance from secondary school is negatively and statistically significant.

EUROPEAN REPORT
DEVELOPMENT

Overall, we summarise our main findings in Figure 8, which plots the marginal effect of financial resources (the marginal effect of per adult consumption) and cultural resources (the marginal effect of father with college training) when the model is separately estimated by gender. The co-efficients seem to depict a sort of frontier of "production possibilities" in terms of resource availability. Countries with high educational attainment face stronger constraints from cultural constraints associated to parental education, while countries with low educational attainment fight against household financial constraints.

According to our results, financial aid may be effective in increasing enrolment when the average educational attainment is relatively low, as in the case of Uganda and Mauritania. In contrast, when a country achieves a sufficient level of educational attainment, the true obstacle may emerge from parental education and may require an improvement in the quality of teaching in order to overcome it. In both cases, any intervention able to increase school enrolment implies long-lasting benefits, given the positive spill-over of parental education on the probability of children attending school.

Figure 8 - Average marginal effects on the probability of school attendance, by gender
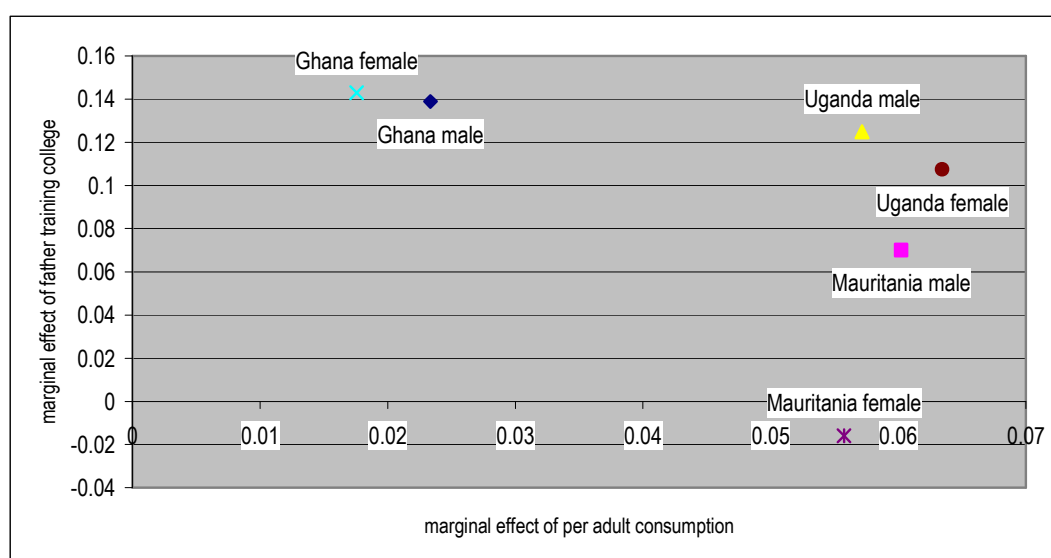
3.2. Return to education

The standard model of human capital investment (Card 1999) explains educational choices in terms of costs and benefits, conditional on either the existence of perfect financial markets, or on sufficient family resources. While the role of costs (proxied by distance) and resources (proxied by family consumption) have already been discussed in the previous section, in the present section, we analyse the role of incentives. Although it is implausible, it nonetheless remains possible that low educational attainment can be accounted for by low return of educational certificates in the labour market.

It is not easy to identify labour market return to education when significant shares of the population are either unemployed or employed in the informal sector. For this reason, we have identified five potential areas where we can assess whether education makes a difference:

1. working or not working;

2. obtaining a good job (in terms of wage and duration);

3. earning a monetary wage;

4. reduce income volatility (as a proxy for the risk of income risk);

5. attaining a decent level of consumption.

In Table 11, we provide descriptive statistics for each of these measures. For these countries, the employment rate is significantly different: in the relevant population aged between 15 and 60; Ghana and Uganda achieve 72% and 77% respectively, while Mauritania scores 42% only. Nevertheless, for all countries, occupational groups are ordered in quite similar ways: family aid and self-employment are the least paid occupations, with the highest earnings variability; in contrast, public employment represents the top of the pay scale, associated with the lowest income risk. Interestingly enough, *per capita* consumption is ranked in a similar way, suggesting that some sort of assortative mating in the family composition is at work.[14]

Table 11 – Occupations, wages and consumption for employed individuals – 2000-2005

Ghana 2005

occupation	observations for occupations	mean (log) wage	standard deviation log wages	observations with positive wage	median (log) *per capita* consumption
unpaid family worker	5077	11.869	1.273	322	13.592
own account worker	7984	12.405	1.259	6640	14.072
employer	568	13.278	1.459	498	14.653
private permanent	1513	13.241	0.931	1505	14.581
govt permanent	803	13.891	0.913	790	14.759
Total	15945	12.681	1.304	9755	14.023

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[14] However, the sample correlation of (log of) individual wage and (log of) per capita consumption is not that high: 0.36 for Ghana, 0.47 for Uganda and 0.31 for Mauritania.

EUROPEAN REPORT
DEVELOPMENT

Mauritania 2000

occupation	observations for occupations	mean (log) wage	standard deviation log wages	observations with positive wage	median (log) *per capita* consumption
unpaid family worker	3034	8.607	1.189	471	10.850
own account worker	5103	na	na	na	11.261
private employee	595	9.483	1.072	529	11.685
government employee	985	9.883	0.851	902	11.808
Total	9717	9.456	1.130	1902	11.214

Uganda 2005

occupation	observations for occupations	mean (log) wage	standard deviation log wages	observations with positive wage	median (log) *per capita* consumption
unpaid family worker	9234	10.159	0.851	537	10.266
own account worker	7637	10.544	0.947	1295	10.326
employer	94	11.342	1.128	26	10.634
private employee	2219	10.969	1.033	2056	10.646
government employee	463	12.122	0.817	444	11.122
Total	19647	10.863	1.093	4358	10.355

In Table A.4 in the Appendix, we estimate the relevant correlations for the probability of being employed (columns 1-2-5-6-9-10) and for climbing up in the social ladder represented by occupational groups (columns 3-4-7-8-11-12). In the first case, we use a probit model, while in the latter we adopted and ordered the probit one. Education is expressed either through dummies (odd columns) or in years of education (even columns).

With regard to employment probability, we find that educational attainment tends to be negatively correlated with employment probability (especially for Ghana and Mauritania), as if the limited employment probabilities were reduced by the expectations of educated people (sometimes indicated as the "excessive choosiness" of graduates).[15] They seem to confirm that education does not help people to enter the labour force, rather the opposite. But looking carefully at Table 11, one has to consider that between one third (Ghana and Mauritania) and half (Uganda) of the subjects classified as "employed" are actually taking up unpaid family jobs! These results are consistent with labour markets which are segmented between formal and informal dimensions, in which educated workers accept only high-quality jobs and possibly experience long spells of unemployment and/or migration. But education may favour the transformation into formal labour markets, since the availability of an educated (domestic) labour force may be capable of attracting foreign capital (Checchi *et al.* 2007).

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[15] In some countries in Sub-Saharan Africa, secondary and tertiary education are associated with higher unemployment rates among youth . One possible explanation proposed by Garcia and Fares 2008 is that the more educated youth are, the higher their reservation wage and returns to job search.

EUROPEAN REPORT DEVELOPMENT

Thus, formal education goes hand in hand with formal labour markets, and the former has problems in proceeding without the latter. If a person is employed in paid work, education seems effective in pushing that person up the social ladder. Whenever an educational credential is taken to a formal labour market, it becomes a powerful vehicle for better job opportunities, the effect being stronger where the average educational attainment is higher (as in the case of Ghana). These results are summarised in Table 12 and plotted in Figure 9, where the marginal effect of an additional year of education on the probability of entering a well-paid occupation increases with the desirability of the same occupation.

Table 12 – Average marginal effect of one additional year of schooling

	Ghana2005	Mauritania 2000	Uganda 2005
probability of being employed	-0.003**	-0.007***	-0.001*
probability of becoming unpaid family worker	-0.019***	-0.025***	-0.011***
probability of becoming own account worker	-0.006***	0.010***	0.002***
probability of becoming employer	0.002***		0.001***
probability of becoming private employee	0.011***	0.005***	0.006***
probability of becoming government employee	0.012***	0.010***	0.002***

*significant at 10%; ** significant at 5%; *** significant at 1%*

Figure 9 - Average marginal effect of one year of schooling onto the probability of achieving specific employment positions
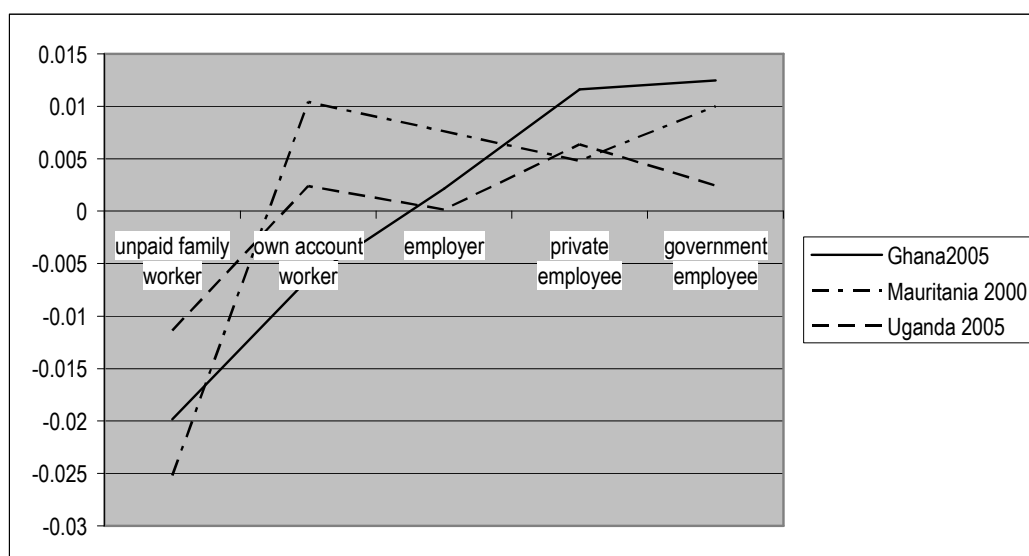
We then estimate a traditional Mincerian equation among those reporting a positive wage (see Table A.5 in the Appendix). Since being employed in the formal labour market could represent a positive self-selection, we have also considered household *per capita* consumption as an alternative welfare measure at individual level.[16] In Table 13,

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[16] If formal education provides adequate returns only when spent in formal labour market, one has to consider the potential self-selection into formal occupation. However, in order to formally

we report the most significant results given by the (average) percentage increase in the wage rate (or in the consumption *per capita*) associated to an additional year of education. The estimated OLS co-efficients could be biased due to either unobservables (for example, ability) and/or to measurement errors, and therefore we resort to instrumental variable estimation, using father education as an instrument for the years of child education.[17] IV (instrumental variable estimation) returns tend to be higher than OLS ones, indicating downward biases in standard OLS regressions. What is most surprising is that returns to education are higher in countries in which the average educational attainment in the population is also higher, contradicting a standard framework of relative supply and demand for human capital, but being fully compatible with a model of increasing returns in human capital growth.

Table 13 – Return to education of one year of schooling

	Ghana 2005	Mauritania 2000	Uganda 2005
wage return to one year of schooling (OLS)	0.094***	0.060***	0.093***
wage return to one year of schooling (IV)	0.160***	0.065***	0.133***
consumption return to one year of schooling (OLS)	0.055***	0.032***	0.057***
consumption return to one year of schooling (IV)	0.188***	0.086***	0.096***

* significant at 10%; ** significant at 5%; *** significant at 1%

We can then summarise the results obtained so far by claiming that schooling brings in a double dividend in the labour market, as it is associated with both better jobs and higher wages. The main obstacle is represented by the extent of the formal labour markets, since both gains materialise conditional to entering formal employment. However, even abstracting from the formal employment relationship, education is, on average, rewarded through higher levels of consumption at household level, through either higher self-employment incomes or through positive association to spouse income.

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estimate this process (using for example an approach à la Heckman), one needs to introduce identifying restrictions, which account for increased probability of being employed in the formal sector of the economy without being correlated with the wage outcome. Since we were unable to trace out potential variables for the selection equation, we have followed an alternative rule. Despite being outside the formal labour market for whatever reason (rural area, negative shocks, family disruption, etc), if there exist assortative mating an educated person is more likely to enjoy higher level of welfare through the spouse. For this reason in table 13 we have also considered the per-capita consumption measured at household level as proxy for individual welfare.

[17] In the case of omitted variables, a potential instrument should not be correlated with the omitted variable. If there is intergenerational genetic transmission of ability, the educational attainment of parents would be correlated with unobservable ability of the child. Educational reforms would be more appropriate as instruments, but given the low level of enforceability they may be ineffective in raising educational attainment. Therefore the results presented in table 13 are just indicative of the potential existence of biases, more than presenting an unbiased estimate of the exact return to an additional year of education.

4. Policy discussion and conclusions

In the present paper, we have shown that the consideration of educational choices gives more role to social protection schemes. Without disputing whether they have to take the form of conditional or unconditional cash transfers, we have seen that parental money matters with regard to whether children attend school or not. At least, this is true for the three countries which we have explicitly considered: Ghana, Mauritania and Uganda; but macro evidence behaves in accordance with our finding in the micro-data.

We have also found that education makes a difference in the working life of the individual. It may represent an obstacle to entering the formal labour market, because it probably raises expectations which are incompatible with existing employment conditions. But once the transition has occurred, an additional year of education is associated with better employment prospects, higher wages and reduced income volatility. We have also extended the analysis to welfare distribution, by using consumption (equivalised at household level) as proxy for it: even in such a case, additional education is associated with higher (life-time) welfare.

Combining these results provides an inter-temporal twist in the analysis of actual social protection schemes. As long as they relax the financial constraints on poor families, they increase school opportunities of the offspring of the poor, an effect which is stronger with conditional cash transfers. Additional education in the young generation translates into less need for social protection when they are adults: on average, they will be better employed and less exposed to the risk of unemployment, thus killing two birds with one stone.

This is obviously not the end of the story. We have seen that schooling is also prevented by a (lack of) cultural support from educated parents, as well as by cultural heritage (colonial past experience, quality of institutions). But, once again, a current investment in education has an inter-generational positive spill-over, since it relaxes cultural constraints on the following generation. Other papers (Filmer and Prichett 1999, Filmer 2007) have highlighted the importance of school quality compared to school availability. Our results do not contradict their findings, since community isolation does not seem to be an obstacle to the probability of attending school. Nevertheless, a more detailed analysis based upon detailed information regarding the quality and quantity of the education provided would be necessary, since aggregate data are not perfectly consistent with this claim.

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Appendix

Table A.1 - Determinants of child enrolment – population aged 4-25 - Ghana 2005 - Probit

	1	2	3	4
	all	all	male	female
	enrolled	enrolled	enrolled	enrolled
age (years)	0.3	0.311	0.247	0.31
	[6.13]***	[6.45]***	[4.57]***	[6.05]***
age²	-0.016	-0.017	-0.014	-0.017
	[9.21]***	[9.46]***	[7.14]***	[9.01]***
urban	0.207	0.323	0.459	0.063
	[1.47]	[2.26]**	[2.95]***	[0.44]
male	0.195	0.212		
	[2.31]**	[2.56]**		
Log real per adult equivalent household consumption	-0.014	0.005	0.1	0.092
	[0.15]	[0.05]	[0.99]	[1.05]
number family members	0.027	0.026	0.025	0.027
	[1.44]	[1.41]	[1.16]	[1.40]
father educ==primary	0.314	0.351	0.369	0.153
	[1.68]*	[2.02]**	[1.43]	[0.71]
father educ==middle/junior secondary school	0.119	0.215	0.27	0.24
	[1.12]	[2.08]**	[1.71]*	[1.69]*
father educ==senior secondary school	0.33	0.397	0.448	0.438
	[1.70]*	[2.05]**	[1.46]	[1.54]
father educ==training college	0.674	0.717	0.597	0.751
	[1.97]*	[1.98]**	[1.84]*	[2.33]**
father educ==tertiary	0.702	0.54	0.378	0.792
	[1.37]	[0.93]	[0.87]	[0.70]
mother educ==primary	0.495	0.499	0.392	0.622
	[3.40]***	[3.45]***	[1.79]*	[3.19]***
mother educ==middle/junior secondary school	0.332	0.409	0.334	0.408
	[2.61]***	[3.27]***	[2.03]**	[2.57]**
mother educ==senior secondary school	0.071	0.049	0.23	0
	[0.23]	[0.15]	[0.65]	[0.00]
mother educ==training college	-0.155	-0.136	-0.075	-0.063
	[0.47]	[0.41]	[0.14]	[0.12]
mother educ==tertiary	0.113	0.252		0.721
	[0.29]	[0.56]		[0.39]
socio-economic group==Public	0.199	0.174	0.557	-0.405
	[0.61]	[0.51]	[1.55]	[1.33]
socio-economic group==Wage-priv-formal	-0.829	-0.846	-0.648	-1.136
	[2.71]***	[2.83]***	[2.08]**	[3.21]***
socio-economic group==Wage-priv-informal	-0.53	-0.548	-0.365	-0.747
	[2.07]**	[2.13]**	[1.21]	[2.44]**
socio-economic group==Self-agro-export	0.309	0.281	0.586	-0.059
	[1.00]	[0.93]	[1.56]	[0.18]

socio-economic group==Self-agro-crop	-0.368	-0.515	-0.304	-0.786
	[1.53]	[2.21]**	[1.24]	[3.12]***
socio-economic group==Self-business	-0.282	-0.351	-0.113	-0.519
	[1.28]	[1.62]	[0.47]	[2.08]**
Average log time to collect water from main source, minutes	-0.019	-0.028	-0.013	-0.034
	[1.03]	[1.47]	[0.59]	[1.83]*
roof==palme leaves/raffia/thatch	-1.153			
	[5.88]***			
roof==corrugated iron sheets	-0.315			
	[2.30]**			
Observations	1905	1905	769	1135

*t statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% - survey robust errors – constant included*

Table A.2 - Determinants of child enrolment – population aged 4-25 – Mauritania 2000 – Probit

	1	2	3
	all	male	female
	enrolled	enrolled	enrolled
age	-0.342	-0.291	-0.375
	[7.38]***	[5.66]***	[7.25]***
age²	0.005	0.004	0.006
	[3.04]***	[2.25]**	[3.80]***
urban	0.183	0.279	0.353
	[1.27]	[3.15]***	[4.15]***
male	0.126		
	[1.90]*		
Log real per adult equivalent household consumption	0.185	0.264	0.244
	[2.07]**	[4.11]***	[3.87]***
number family members	0.025	0.031	0.03
	[2.78]***	[3.20]***	[3.54]***
father education==less than primary	-0.114	0.02	-0.098
	[0.81]	[0.10]	[0.55]
father education==completed primary	-0.018	-0.201	0.008
	[0.09]	[1.24]	[0.05]
father education==college	0.25	0.082	0.282
	[1.26]	[0.38]	[1.42]
father education==lycee	0.436	0.307	-0.07
	[1.66]*	[1.11]	[0.26]
father education==degree	0.717	1.011	0.237
	[4.30]***	[1.96]*	[0.72]
mother education==less than primary	-0.191	-0.035	-0.496
	[1.68]*	[0.22]	[3.80]***
mother education==completed primary	-0.08	-0.022	-0.375
	[0.44]	[0.12]	[2.40]**
mother education==college	-0.5	-0.437	-0.314
	[2.50]**	[1.51]	[1.10]
mother education==lycee	0.142	-0.347	0.08
	[0.40]	[0.69]	[0.12]
mother education==degree	0	0	0
	[.]	[.]	[.]
socio-economic group==government employee	0.375	0.196	0.412
	[2.36]**	[1.17]	[2.45]**
socio-economic group==private sector employee	0.03	-0.135	0.173
	[0.15]	[0.65]	[0.88]
socio-economic group==self-employed agriculture	0.145	-0.056	-0.052
	[0.99]	[0.55]	[0.49]
socio-economic group==self-employed not agriculture	0.03	-0.113	0.047
	[0.20]	[1.05]	[0.43]
socio-economic group==family workers and others	-0.252	-0.471	-0.076
	[1.18]	[2.17]**	[0.25]

socio-economic group==unemployed	0.002	0.117	-0.104
	[0.01]	[0.81]	[0.75]
Average log time to collect water from main source, minutes	0.002	0.016	0
	[0.12]	[1.41]	[0.04]
Observations	4184	2119	2065

*t statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% - survey robust errors – constant included*

Table A.3 - Determinants of child enrolment – population aged 4-25 – Uganda 2005 – Probit

	1	2	3	4	5
	all	all	male	female	all
	enrolled	enrolled	enrolled	enrolled	enrolled
age	0.373	0.375	0.436	0.338	0.383
				[5.24]**	
	[9.39]***	[9.43]***	[9.28]***	*	[9.45]***
age2	-0.018	-0.018	-0.019	-0.018	-0.018
	[12.97]**	[13.02]**	[11.82]**	[7.88]**	[12.95]**
	*	*	*	*	*
substratum	-0.06	-0.047	-0.024	-0.097	-0.098
	[0.71]	[0.57]	[0.20]	[0.81]	[1.23]
male	0.354	0.357			0.354
	[6.43]***	[6.50]***			[6.32]***
Log real per adult equivalent household consumption	0.261	0.304	0.259	0.337	0.274
				[4.82]**	
	[5.38]***	[6.38]***	[4.46]***	*	[5.78]***
numb.household members	0.069	0.072	0.074	0.07	0.071
				[7.14]**	
	[8.59]***	[9.20]***	[5.89]***	*	[8.92]***
father educ==less than primary	0.159	0.155	0.222	0.108	0.158
	[1.96]*	[1.89]*	[1.88]*	[0.95]	[1.92]*
father educ==completed primary	0.179	0.169	0.158	0.224	0.167
	[1.90]*	[1.79]*	[1.19]	[1.77]*	[1.75]*
father educ==completed o level	0.471	0.462	0.582	0.419	0.471
				[2.85]**	
	[3.85]***	[3.77]***	[3.17]***	*	[3.85]***
father educ==completed A level	0.533	0.527	0.565	0.57	0.538
				[2.91]**	
	[3.34]***	[3.31]***	[2.27]**	*	[3.30]***
father educ==completed university	0.581	0.577	0.201	1.094	0.57
	[1.96]*	[1.94]*	[0.52]	[2.44]**	[1.90]*
mother educ==less than primary	0.06	0.08	0.162	0.003	0.078
	[0.80]	[1.07]	[1.68]*	[0.03]	[1.04]
mother educ==completed primary	0.098	0.13	0.199	0.096	0.109
	[1.10]	[1.48]	[1.62]	[0.81]	[1.25]
mother educ==completed o level	0.242	0.273	0.09	0.437	0.264
	[1.52]	[1.72]*	[0.42]	[2.36]**	[1.64]
mother educ==completed A level	0.647	0.674	1.306	0.397	0.835
	[2.06]**	[2.18]**	[1.45]	[0.87]	[2.69]***
mother educ==completed university	0.188	0.138	0.004		0.169
	[0.31]	[0.23]	[0.01]		[0.28]
earnings source==subsistence farming	0.185	0.23	0.067	0.351	0.21
	[0.98]	[1.21]	[0.26]	[1.73]*	[1.08]
earnings source==commercial farming	0.206	0.255	-0.191	0.59	0.239
	[0.81]	[1.02]	[0.59]	[2.01]**	[0.94]

34

earnings source==wage employment	0.038	0.077	-0.133	0.204	0.048
	[0.19]	[0.39]	[0.49]	[0.89]	[0.23]
earnings source==non agricultural enterprises	0.112	0.156	0.084	0.224	0.135
	[0.54]	[0.76]	[0.30]	[1.01]	[0.66]
earnings source==transfers	0.729	0.778	0.438	1.056	0.735
				[4.17]**	
	[3.19]***	[3.40]***	[1.39]	*	[3.17]***
Average log time to collect water from main source, minutes	-0.021	-0.021	-0.135	0.045	
	[0.36]	[0.36]	[1.67]*	[0.67]	
roof==thatch, straw	-0.221				
	[0.58]				
roof==iron sheets	-0.053				
	[0.14]				
log distance km nearest primary school, private or public					0
					[0.02]
log distance km nearest secondary school, private or public					-0.028
					[2.27]**
Observations	5008	5008	2148	2857	4963

*t statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% - survey robust errors – constant included*

Table A.4 - Determinants of occupational status – Probit for "employed" and ordered probit for "occupation"

	Ghana 2005				Mauritania 2000				Uganda 2005			
	1 employed	2 employed	3 occupation	4 occupation	5 employed	6 employed	7 occupation	8 occupation	9 employed	10 employed	11 occupation	12 occupation
male	0.232	0.174	0.601	0.505	0.867	0.867	0.741	0.736	0.117	0.387	0.676	0.781
	[7.83]***	[5.19]***	[19.69]***	[15.88]***	[15.46]***	[15.38]***	[12.07]***	[12.04]***	[3.36]***	[7.91]***	[27.50]***	[28.69]***
age (years)	0.254	0.304	0.164	0.161	0.09	0.094	0.074	0.073	0.13	0.108	0.168	0.12
	[30.37]***	[32.78]***	[17.10]***	[15.45]***	[10.40]***	[11.05]***	[4.97]***	[4.95]***	[16.79]***	[11.99]***	[22.42]***	[13.83]***
age²	-0.003	-0.003	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001
	[26.64]***	[27.46]***	[15.45]***	[13.61]***	[8.37]***	[8.73]***	[2.84]***	[2.78]***	[12.29]***	[10.41]***	[19.67]***	[12.43]***
urban	-0.483	-0.564	0.584	0.552	-0.4	-0.41	0.767	0.762	-0.774	-0.643	0.546	0.576
	[8.69]***	[9.88]***	[13.15]***	[12.59]***	[4.50]***	[4.45]***	[6.88]***	[6.82]***	[16.25]***	[11.46]***	[10.95]***	[11.18]***
numb. children	-0.015	-0.027	-0.076	-0.086	0.062	0.062	-0.066	-0.066	0.008	0.008	-0.095	-0.088
	[1.61]	[2.48]**	[8.73]***	[8.80]***	[2.67]***	[2.63]***	[2.49]**	[2.49]**	[1.03]	[0.81]	[14.43]***	[13.34]***
primary (not completed)	0.635		-0.799		-0.095		0.39		0.834		0.421	
	[1.06]		[0.84]		[1.30]		[4.19]***		[19.51]***		[14.30]***	
primary (completed)	0.235		-0.653		-0.228		0.536		0.796		0.434	
	[0.39]		[0.69]		[2.97]***		[5.97]***		[15.23]***		[11.65]***	
post-primary training									1.126		1.721	
									[8.41]***		[16.36]***	
junior secondary	-0.25		0.399		-0.374		1.058		0.793		0.534	
	[5.50]***		[10.82]***		[5.40]***		[11.47]***		[13.69]***		[13.13]***	
senior secondary	-0.654		0.915		-0.174		1.339		0.489		0.878	
	[7.80]***		[9.22]***		[2.23]**		[10.41]***		[3.74]***		[6.22]***	
post-secondary training	-0.15		1.422		0.594		1.403		0.695		1.795	
	[1.98]**		[19.23]***		[1.21]		[2.83]***		[6.91]***		[16.26]***	
college degree	-0.039		1.795		-0.234		1.303		0.017		0.7	
	[0.44]		[18.79]***		[2.11]**		[7.08]***		[0.08]		[3.09]***	
Years of schooling completed		-0.012		0.094		-0.022		0.093		-0.01		0.039
		[2.04]**		[17.08]***		[4.08]***		[13.48]***		[1.83]*		[9.87]***
Observations	18186	12405	13050	8231	17648	17648	7403	7403	17221	13480	13905	12265

*t statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% - survey robust errors – constant included*

Table A.5 – Returns to education – (log)wages and (log)consumption per capita - OLS

	Ghana 2005						Mauritania 2005						Uganda 2005					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	ols log wage	ols log wage	iv log wage	ols log consum	ols log consum	iv log consum	ols log wage	ols log wage	iv log wage	ols log consum	ols log consum	iv log consum	ols log wage	ols log wage	iv log wage	ols log consum	ols log consum	iv log consum
male	0.374 [12.14]***	0.305 [9.43] ***	0.228 [5.98] ***	-0.096 [9.01] ***	-0.114 [9.37] ***	-0.228 [11.80]***	0.288 [2.48] **	0.286 [2.45] **	0.343 [5.12] ***	0.007 [0.48]	0.007 [0.48]	-0.067 [5.66] ***	0.426 [15.36]***	0.343 [11.94]***	0.233 [6.44] ***	-0.017 [1.58]	-0.075 [6.90] ***	-0.168 [11.09]***
age (years)	0.051 [5.36] ***	0.041 [3.71] ***	0.026 [2.31] **	0.019 [5.50] ***	0.026 [6.29] ***	-0.007 [1.52]	0.052 [1.05]	0.051 [0.99]	0.086 [5.61] ***	0.009 [1.97] **	0.008 [1.51]	0.024 [7.95] ***	0.062 [6.87] ***	0.067 [7.31] ***	0.047 [4.67] ***	-0.015 [4.34] ***	0.001 [0.16]	-0.01 [2.66] ***
ge²	-0.001 [4.53] ***	0 [3.09] ***	0 [2.08] **	0 [4.39] ***	0 [5.53] ***	0 [0.21]	0 [0.46]	0 [0.43]	-0.001 [3.81] ***	0 [0.64]	0 [0.48]	0 [4.33] ***	-0.001 [6.16] ***	-0.001 [6.02] ***	0 [3.37] ***	0 [3.51] ***	0 [0.86]	0 [4.06] ***
urban	0.545 [10.36]***	0.554 [10.06]***	0.454 [10.01]***	0.461 [11.75]***	0.437 [11.43]***	0.217 [9.29] ***	0.543 [2.00] **	0.529 [1.90] *	0.298 [4.61] ***	0.537 [7.04] ***	0.542 [6.79] ***	0.364 [23.34]***	0.527 [12.48]***	0.472 [10.34]***	0.307 [6.79] ***	0.591 [14.79]***	0.493 [14.65]***	0.306 [16.33]***
primary (not completed)	-0.437 [5.44] ***			0.094 [0.44]			0.305 [2.12] **			0.156 [2.61] ***			0.028 [0.59]			-0.161 [6.49] ***		
primary (completed)	-0.29 [2.92] ***			0.336 [1.56]			0.435 [3.38] ***			0.235 [4.80] ***			0.217 [3.67] ***			0.001 [0.05]		
post-primary training													1.097 [17.24]***			0.434 [9.52] ***		
junior secondary	0.367 [7.50] ***			0.409 [15.63]***			0.487 [2.90] ***			0.365 [6.49] ***			0.62 [9.65] ***			0.203 [7.19] ***		
senior secondary	0.779 [9.15] ***			0.508 [12.00]***			0.691 [3.96] ***			0.416 [6.66] ***			0.959 [7.20] ***			0.466 [8.59] ***		
post-secondary training	0.934			0.628			0.628			0.349			1.387			0.754		

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16	C17	C18
	[15.03]***			[16.97]***			[1.57]			[2.22] **			[17.76]***			[14.65]***		
college degree	1.591			1.015			1.137			0.483			1.19			0.785		
	[17.01]***			[19.13]***			[6.12] ***			[6.80] ***			[6.72] ***			[8.20] ***		
Years of schooling completed		0.094	0.16		0.055	0.188		0.06	0.065		0.032	0.086		0.093	0.133		0.057	0.096
		[15.38]***	[8.26] ***		[16.47]***	[17.02]***		[5.57] ***	[9.99] ***		[7.44] ***	[25.59]***		[21.27]***	[16.06]***		[21.34]***	[24.55]***
Observations	8741	6309	5554	18219	12425	9076	1695	1695	1520	17648	17648	14915	4087	3900	3109	17968	13511	10786
R-squared	0.21	0.18		0.27	0.21		0.21	0.2		0.23	0.23		0.39	0.37		0.2	0.24	

*t statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% - survey robust errors – constant included*