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The choice of arabo-islamic education in sub-Saharan Africa: findings from a comparative study

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Key words: Education; school choice; arabo-islamic education, Sub-Saharan Africa

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Abstract

While it is a central issue for most sub-Saharan African countries, quantification and qualification of the Arabo-Islamic education choice appear particularly poorly documented. After an inventory of existing data, we rely on representative household surveys from 9 countries (Nigeria, Côte d'Ivoire, Mauritania, Gambia, Burkina Faso, Senegal, Chad, Somalia and Comoros) with data on formal Arabo-Islamic education and non-formal Arabo-Islamic education). Arabo-Islamic education appears mainly driven by non-formal Arabo-Islamic education institutions like traditional Quranic schools rather than Arabo-Islamic education structure recognized by States. We show that a large number of recorded "out-of-school" children of primary school age are in fact enrolled in Quranic schools and that there are significant differences between households depending on the education choice. Non-formal Arabo-Islamic education institutions appear as an important vector of knowledge transmission for the typically most excluded populations like the poorest households and those in rural areas, but the most excluded population appears even more as really "out-of-school". However, Arabo-Islamic schools seem to exclude vulnerable populations as much as other formal schools in the country do. In the context of Nigeria, parents appear sensitive to the quality of formal education provision. Thus when perceived quality deteriorates, the poorest households retrieve their children from formal schools.

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1 Introduction

Fifteen years after the launch of the Millennium Development Goals (MDGs) in 2000, Universal Primary Education (UPE) is not a reality for most African countries. Nearly 30 million African children between 6 and 11 years old are considered as "out of school" (UNESCO, 2015). But analysis shows that many of them are in fact enrolled in non-formal educational institutions especially Quranic schools, in Sahelian countries (Antoninis, 2014; Ware, 2014), and therefore must be distinguished from those who have no education access of any kind. Precursor to other forms of education, the Arabo-Islamic education model is central to the African continent and appears as a parallel education system present in almost all African countries. Over the centuries and until today, a large number of African children have acquired their religious and spiritual education as well as values and skills from arabo-slamic education institutions. In sub-Saharan Africa, this question of the Arabo-Islamic education in general and Quranic schools in particular remains understudied by academics and inadequately addressed in the organization and planning of African education systems (Stambach, 2010). This subject stimulates many polemics and attempted reforms but very little is known about how many children are concerned, who they are and what the reasons for this choice are (Gérard, 1997).

The academic literature has traditionally analyzed educational choices and household behavior with a simplified model of investment in human capital, in which parents maximize their intertemporal utility (Ferreira and Schady, 2009). Most economic models emphasize some determinants that households consider when they make educational choices: (a) direct and indirect costs of schooling; (b) initial income available for educational expenditures and credit access; (c) opportunity cost of children's enrollment in school; (d) parents' beliefs about expected returns on education. Beyond pure material reward highlighted by most economic models, socio-anthropologists stress (e) the impact of values that the school delivers and in particular religious knowledge are key elements on which households base their decisions (Brenner, 2001) (Ware, 2014). Theoretical models of choices between several types of schools stress that how children are assorted depends on their own ability and on parent's incomes (Dennis Epple, 1998) (Dennis Epple, 2008) or depends on their religion and ethnic group (Cohen-Zada and Justman, 2005).

In African countries with a significant share of Muslim population, Arabo-Islamic schooling can be seen as an investment in one's community, which is often responsible for those schools (Izama, 2014). Chen (2010) documents immediate returns on Arabo-Islamic schooling: parents consequently have better access to credit. This suggests that Arabo-Islamic schooling may provide important social norms and connexions that facilitate one's social and economic integration. Dev, Mberu, and Pongou (2016) model choices in Arabo-Islamic education as an investment in ethnic capital as opposed to human capital. When the two options available to parents are not only public or private schools but formal or community-level informal schooling like Quranic school, households which invest the most in formal schooling are in general the richest, those with children with the best intellectual ability or those who belong to minority ethnic group within their religion. The key element of the Dev, Mberu, and Pongou (2016) analysis which explains the contrast of their result is the inclusion of social network effects.

From the traditional or modern Quranic schools, through madrasas, medersas and Franco-Arab schools, this category of educational institution covers a large range of realities in specific contexts and times. Despite its ubiquity in the Sahelian countries, a part of Arabo-Islamic education has no institutional recognition. Governments and international organizations often neglect this type of educational structure. However given the importance of the subject some countries attempt to integrate and formalize Quranic schools or integrate some religious curriculum into formal schools. These types of reforms are however difficult and not always conclusive (Hugon, 2015). The academic literature on Arabo-Islamic education institutions in Africa is much sparser than on other types of educational supply (like public, Catholic or for-profit schools). It focuses primarily on qualitative and unrepresentative data. A comparative approach to the determinants of the choice of the Arabo-Islamic education integrating the wide variety of situations between countries of the African continent is also missing (André and Demonsant, 2009; Chen, 2010; Gemignani, Shojo, and Wodon, 2014; Boyle, 2014). If the quantitative studies on the subject are still limited by the lack of representative data on the subject, our work draws a number of elements from existing representative data.

To fill the gap in the literature we centralize most of data representative of African countries and adopt a comparative approach of the determinants of the choice of Arabo-Islamic education. We develop a typology of Arabo-Islamic education institutions and a methodology to better measure the number of children concerned by this type of education. We first find that the number of children benefiting from non-formal Arabo-Islamic schooling varies over a wide range across sub-Saharan countries (for which data are available) from 1.5% to 33.5%, while the number of children benefiting from formal Arabo-Islamic schooling is smaller and always below 15%. Second, we describe the population benefitting from this type of schooling. Contrary to popular belief, Arabo-Islamic education in fact supports a significant number of girls and sometimes has even better gender parity than other formal institutions. Quranic schools seem also to involve an intermediate class between the richest households which chose the formal schools and the poorest which cannot send their children to any educational structure. Formal Arabo-Islamic education mainly concerns households with higher or at least similar income rather than households enrolled in other formal educational structures. Here again there is a wide variety across countries. Finally we address reasons for enrollment in arabo-islamci schools. Self-reported reasons emphasize religion and culture, and the cost and quality of formal non-Arabo-Islamic schooling. With longitudinal data from Nigeria, we show how enrollment in non-Arabo-Islamic schooling, potentially as a complement to Arabo-Islamic schooling, when children are already enrolled in Arabo-Islamic school, is mostly determined by an increase in perceived quality of education.

The implications of our results for public policy design and monitoring are threefold. First, our analysis underlines the lack of quantitative and easily comparable information across countries on this type of education, both from the household and the supply side perspective. Second it highlights the large diversity of the audience of these types of schools, calling for political action that is adapted to the local context. Finally, it suggests that policies that aim at building gaps between Arabo-Islamic and non-Arabo-Islamic schooling should account for the importance of quality perception in parents' decision to combine these two types of schooling.

The remainder of the paper proceeds as follow. Section 2 provides a typology of Arabo-

Islamic education institutions and a discussion of the available nationally representative sources of information. Section 3 presents the empirical strategy to identify the Arabo-Islamic education choice and section 4 our results of how many children are concerned, what the characteristics of the children are and what reasons explain this choice. Section 5 concludes.

2 Definitions and typology of Arabo-Islamic education in sub-Saharan Africa

As central education providers for several centuries before the start of formal public education systems, Arabo-Islamic education appears now as an alternative to formal education systems in most African countries (Gandolfi, 2003; Fortier, 2003; Ware, 2014). This specific form of knowledge transmission varies extensively across time and countries. In the African context, however, it remains largely understudied by the academic literature and knowledge of most ministries of education and education planners remains very limited.

To facilitate comparison across countries and in line with data availability, **we distinguish two main categories of Arabo-Islamic education**. We focus on educational institutions that educate children old enough to enroll in public primary schools (i.e. children between 6 and 11 years old in most countries). Our distinction criteria between both categories adopt an administrative view: the formalization of the educational institution. The first category of educational institution offers an education recognized by the State as formal. In those educational institutions, teachers teach non-religious fields and curriculum, organizational rules, validation criteria, and schedules are defined or approved by the national ministry of education. On the contrary, the second category of educational institutions is mainly outside of the State's authority. They do not deliver nationally recognized diplomas to sanction knowledge acquisition and most often do not organize exams. This separation criterion appears in line with data availability.

As example of **formal Arabo-Islamic educational institutions**, we can mention madrasahs (Arab word for "school"), mahadras, medersas, integrated Quranic schools or Franco-Arab schools in Francophone African countries. Most of such institutions offer classes on Arabic literature, the Quran, Islamic studies (theology, Islamic law, history...) but also other basic knowledge (mathematics, official languages, geography or physics). The share of those two types of fields (religious and secular) among a given institution varies significantly across institutions. Formal Arabo-Islamic institutions, however, deliver a certificate (which may or may not be recognized by the state) at the end of primary education, allowing the pursuit of studies in other types of educative institutions. The State also has some authority over most of these institutions, which most often respect national curriculums and organize their schedules around the national agenda.

There is also a wide diversity of **non-formal Arabo-Islamic educational institutions**: namely Quranic schools (*Daara Maktab* or *Kuttāb*) where students focus mainly on memorizing the Quran, on learning religious practices and Islamic studies. Among Quranic schools, some are more modern than others; some are more recognized by the State as religious institutions, and finally some offer part-time curriculums that allow students to be

simultaneously enrolled in the formal schools while others are boarding schools. The learning process terminates when students pass the *ijaza* and obtain the authorization to teach Islamic studies. Most often, States and international organization do not consider these institutions as "schools" in the sense that they are transmitting only religious knowledge. [1]

From this distinction between formal and non-formal schools we define a dichotomy of the different types of arabo-isalmic institutions, even though some could actually be considered as mixed or hybrid (Villalon and Tidjani-Alou, 2012). One should however keep in mind that this classification can actually refer to very different realities depending on countries and years. It is also important to note that some children can be enrolled at the same time in formal and non-formal schools and that Arabo-Islamic education can be seen by households as a complement to formal education rather than a substitute [2].

3 Assessing the number of children enrolled in Arabo-Islamic schools in sub-Saharan Africa

3.1 Identifying the sources of information

In the African context, quantitative information on Arabo-Islamic education is very rare and often unreliable (Antoninis, 2014). Adminiistrative data, mostly census data collected by information systems in ministries of education or organizations of formal Arabo-Islamic schools, often only focus on formal institutions. Even among formal private institutions, disaggregated data by type of private education are usually missing.

The best option to accurately estimate the number of children enrolled in Arabo-Islamic education then consists in leveraging representative household surveys as MICS (Multiple Indicator Cluster Surveys), DHS (Demographic and Health Surveys), LSMS (Living Standards Measurement Study) as well as specific survey data collected by the National Institute of Statistics of African countries. However when the surveys ask households about their children's current educational situation, they most often point out only "formal education" and skip any specific details about non-formal education like quranic schools. Hence, most of the surveys make no difference between "out-of-school" children and those who attend non-formal education institutions (be they Arabo-Islamic or not). Among children counted as "out-of-school", a large number seems actually enrolled non-formal education institution. Similarly, children enrolled in formal Arabo-Islamic schools are pooled with children enrolled in other formal schools.

We exhaustively reviewed MICS, LSMS and DHS household surveys as well as other surveys referenced on the International Household Survey Network (IHSN) website [3]. Among over one hundred carefully screened surveys, only 14 contain information on all or some of Arabo-Islamic education and are made publicly available : namely Somalia (MICS, 2006 and

[1] " Programs at level 1 (primary school) are normally designed on a unit or project basis to give students a sound basic education in reading, writing and mathematics along with an elementary understanding of other subjects such as history, geography, natural science, social science, art and music. In some cases religious instruction is featured (UNESCO, International Standard Classification of Education, ISCED 19972007)"

[2] See section 5

[3] https:// http://www.ihsn.org/

2011); Nigeria (DHS, 2010; LSMS, 2010 and 2012); Côte d'Ivoire (ECVM, 2008); Comoros (EIM, 2004); Mauritania (MICS, 2007 and 2012); Gambia (DHS, 2013); Chad (DHS, 2004); Burkina Faso (EICVM, 2009); Senegal (ESPS, 2005 and 2011).

Some only contain information on formal Arabo-Islamic schools (Gambia, Burkina Faso and Senegal). Others contain both information on formal as well as non-formal education institutions (Somalia, Nigeria, Côte d'Ivoire, Comoros, Mauritania and Chad). Surveys often ask different types of questions (cf Appendix: Table 4). Some refer to schools that children currently attend (Somalia 2011, Burkina Faso 2009, Nigeria 2012, Côte d'Ivoire 2008, Senegal 2011). Others refer only to schools where children attended at their highest level of education (Mauritania 2011, Gambia 2004, Chad 2004) or simply the types of schools they have attended (Comoros 2004). In only two cases (Mauritania and Nigeria) can we find information on parents' motivation for their educational choice. Finally, in Nigeria, Somalia, Senegal and Mauritania, it is possible to identify two waves of surveys and therefore try to estimate the temporal evolution of the different types of schoolings. Nigeria is however the only country where nationally representative panel data are available.

3.2 Population of interest

In this paper, we focus on primary school-aged children: namely, 6- to 11-year-old children. To make a comparative analysis possible, we collapse educative choices into four options [4]: (1) no education of any kind; (2) non-formal Arabo-Islamic education and nothing else; (3) formal Arabo-Islamic education and no other formal school; (4) other formal education (either public or non-Arabo-Islamic private schools). Formal Arabo-Islamic schools refer to *madrasahs*, *mahadras*, *médersas*, *integrated Quranic schools* or *franco-arab* schools. The different types of non-Arabo-Islamic formal (either public or private) schools are all collapsed into one category. We consider those four options as exclusive and not ordered.

In particular, we rely on the assumption that reported enrollment in formal schools does not exclude simultaneous enrollment in Quranic schools, while on the contrary there might not be any simultaneous enrollment in formal schools when surveyed people report enrollment in Quranic schools.

Except for Somalia, Nigeria and Comoros, our data does not allow us to identify children simultaneously enrolled in different types of schools. Among the two countries with an almost entirely Muslim population, most school-aged children attend both types of schools (91% attended both in Comoros in 2004 and 84% were simultaneously enrolled in both in Somalia in 2011). The majority of school-aged children enrolled in Quranic schools also attend formal schools (81% in Comoros and 50% in Somalia). In Nigeria Muslim school-aged children are more likely to be enrolled in both formal and Quranic schools than only in formal schools and 60% of Quranic schools are also enrolled in formal schools)

The four options of our model must be interpreted as a choice to give (1) no education of any kind; (2) only non-formal Arabo-Islamic education; (3) formal Arabo-Islamic education and possibly non-formal Arabo-Islamic education; (4) formal non Arabo-Islamic education and possibly non-formal Arabo-Islamic education.

Except for the quantification of how many children are concerned (section 3.1), we further

[4]Children enrolled in non-formal non-Arabo-Islamic schools are very few and therefore excluded

restrict the sample to Muslim households in countries where there is a significant non-muslim population. Indeed, there are only very few non-muslim children who decide to enroll in Arabo-Islamic schools[5]. As most of the population is Muslim in Somalia (100%), in Comoros (98%), in Mauritania (100%) and in Gambia (90%) [6] our analysis includes the entire population in those countries.

4 Empirical strategy

4.1 Determinants of Arabo-Islamic schooling choices

In addition to descriptive statistics, we leverage econometric methods to test the impact of parents' and children's characteristics on the decision to enroll in Arabo-Islamic education institutions. We use a logit binomial model. It is indeed impossible to order the discret values of the dependent variable without value judgment, and therefore we focus on two-choice models where we compare two-by-two the different types of schooling. We estimate the following equation:

$$Y_{chr} = \beta^0 + \beta^1 {X^1}_{chr} + \beta^2 {X^2}_{hr} + \nu_r + \epsilon_{chr} \quad (1)$$

In each model, Y_{chr} is a dummy variable, indicating whether parents in household h and region r chose to enroll child c (a) in non-formal Arabo-Islamic education institutions rather than no education at all, (b) in Arabo-Islamic education institutions rather than non-Arabo-Islamic education institutions and (c) in formal Arabo-Islamic education institutions rather than in non-formal Arabo-Islamic education institutions.

Where ${X^1}_{chr}$ is a vector of child c's characteristics in region r and household h: namely, gender, age, birth order, relationship to the household head and ${X^2}_{hr}$ is a vector of household h's characteristics: household size, number of children in the household between 5 and 15 years old, income, geographic location in rural areas, a dummy indicating a female household head, the educational level of the household head, a dummy indicating that the household head has received Arabo-Islamic education and ethnic indicators. We account for geographical disparities within a country by including region fixed-effects ν_r. Regressions are clustered at the regional level, to account for heterosckedasticity.

Results are presented in terms of odds ratios. An odds ratio represents the ratio of the probability of an event over the probability that this event does not happen. An odd-ratio larger than 1 should be read as a positive impact of the independent variable on the probability that the event happens, while a ratio smaller than one means a negative impact of the independent variable.

4.2 Dynamics of Arabo-Islamic schooling choices

We complement our analysis by investigating the dynamic dimension of parental choices. The Nigerian LSMS panel dataset shows that transitions from one type of school to the

[5]Respectively, 0.0008% in Chad, 0.0005% in Côte d'Ivoire and 0% in Nigeria. Most household surveys ask specific questions about Arabo-Islamic schooling solely to Muslim children.

[6]https://www.cia.gov/library/publications/the-world-factbook/

other are rather frequent. Among children enrolled in formal primary school in 2010 and between 6 and 9 years old, 2.75% are enrolled only in Arabo-Islamic education institutions in 2012. Transitions from Arabo-Islamic to formal public schools are more frequent: 35% of children enrolled solely in Quranic schools in 2010 are enrolled in formal primary schools in 2012.

In contrast with (André and Demonsant, 2009) we do not try to determine whether the two types of education institutions are substitute or complements, but rather what determines the transition from one type of school to the other. Our outcome of interest is therefore an indicator (Y_{ct}) which equals one when child c is enrolled in formal non-Arabo-Islamic education institutions in year t and equals 0 when they are enrolled in Arabo-Islamic education institutions. We focus on two main determinants: on the one hand demand-side determinants (D_{ct}) related to the evolution of individual characteristics of children or of the household, and on the other hand supply-side determinants (S_{ct}) related to the perceived evolution of the quality of formal non Arabo-Islamic education institutions.

Our objective is therefore to identify the parameters β^1 and β^2:

$$Y_{ct} = \beta^0 + \beta^1 D_{ct} + \beta^2 S_{ct}\epsilon_{ct} \tag{2}$$

However, there are several reasons why these coefficients may not represent the impact of the determinants on schooling choices. On the one hand, they could be biased because of omitted variables. For instance, children in villages where school quality is higher could be richer and as a result more likely to be able to afford schooling costs of non-Arabo-Islamic formal education institutions. On the other hand, causality could be the inverse: children's schooling could affect perceived quality of schooling. In the latter, β^2 would identify the opposite impact of enrollment rate on quality of schooling.

A standard way of dealing with omitted variable bias is to introduce individual fixed effects α_c. Hence we control for all unobserved children's characteristics (and village characteristics for children who do not migrate) that do not vary across time. Similarly, we introduce time fixed-effects (δ_t) to account for any year-specific shock. We therefore estimate the following equation:

$$Y_{ct} = \beta^0 + \beta^1 D_{ct} + \beta^2 S_{ct} + \alpha_c + \delta_t\epsilon_{ct} \tag{3}$$

The two important determinants we focus on following our theoretical framework are household income and perceived quality improvement in formal non-Arabo-Islamic school. Household income is estimated with deflated household expenditures. Perceived improvement in school quality is the aggregated response given by a sample of village's inhabitants who responded to the community survey [7]. However, fixed effect analysis does not account for reverse causality. We therefore complete our analysis to account for potential endogenous variation of income with economic shocks.

Reverse causality is less likely to affect the relationship we estimate between perceived quality of formal non-arabo islamic schools. First, increases of enrollment in formal non-Arabo-Islamic school, without any increase in any teachers' numbers, are $de facto$ linked to an

[7] the question was "Compared to 5 years ago, have conditions for quality of primary (resp. secondary) school education become 1-much worse 2-worse 3-about the same 4-better 5-much better"

increase of the teacher-pupil ratio, often perceived as an important determinant for a decrease in school quality (Checchi and Jappelli, 2004). Second, analyzing heterogeneous effect of perceived quality by income level suggests that reverse causality is actually biasing the estimators downwards. If enrollment levels impacted perceived quality, we could reasonably assume that enrollment of marginalized populations would be linked to a decrease in the perception of quality, and we actually observe the opposite, as we will see later. Third, we rule out the possibility that the opinion of individuals who answer the survey is directly affected by enrollment of their own children. This channel is even more likely when the whole focus group that responded to the community questionnaire has never attended formal non-Arabo-Islamic education institutions. To rule it out, we reproduce the analysis and exclude villages where none of the individuals who responded to the community questionnaire went to formal non-Arabo-Islamic schools. Finally, perceived improvement in school quality refers to the years that precede the survey and are therefore unlikely to be affected by enrollment level at the time of the survey.

5 Results

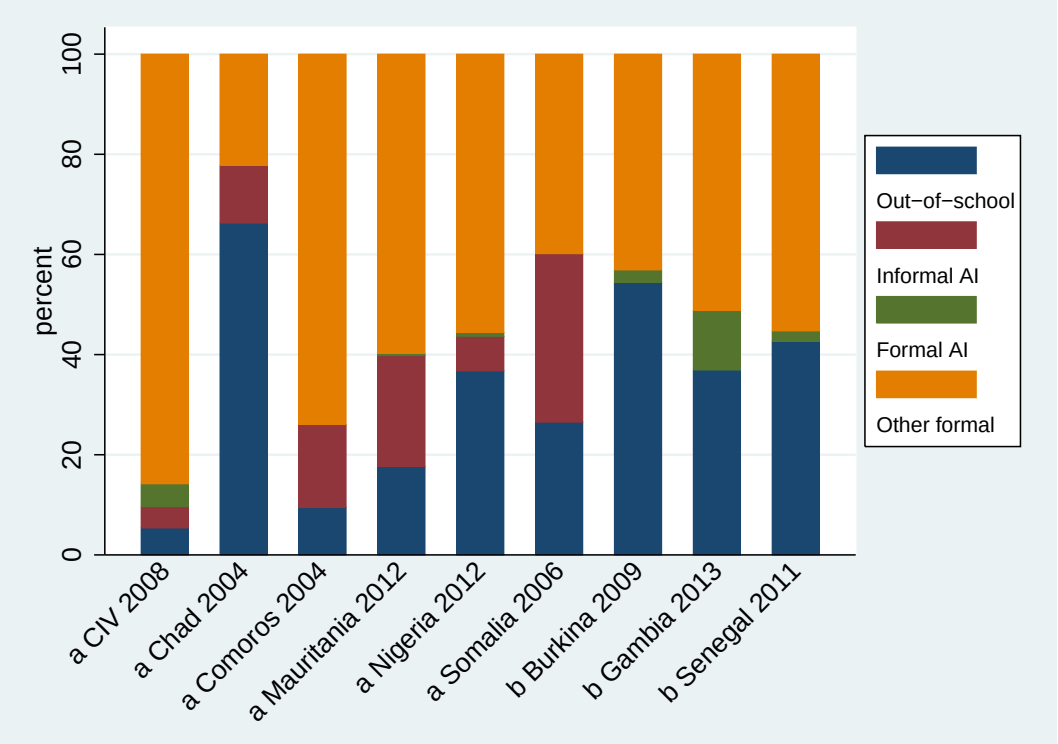
5.1 How many children are concerned?

5.1.1 Most recent estimates

We estimate the share of children enrolled in Arabo-Islamic schools based on household surveys[8]. In the six countries where we can quantify the share of children enrolled only in Quranic schools (receiving an non-formal Arabo-Islamic education) we observe very different situations. They finally represent a rather small proportion in Côte d'Ivoire (1.5%), Nigeria (3.5%), but much larger in Chad (6.8%), Comoros (15.4 %), Mauritania (23.1%) and Somalia (33.5%). Formal Arabo-Islamic education takes charge of only a small proportion of children with 0.4% in Mauritania (Mahadra), 0.46% in Nigeria (integrated Quranic schools), 1.7% in Côte d'Ivoire (Franco-Arab schools), 1.8% in Burkina-Faso (Franco-Arab schools and Medarsa), 3.4% in Senegal (Franco-Arab schools), but almost 11% in Gambia (Madrasa). In all the countries, the wide majority of children are either in formal school or "out-of-school".

[8]It is useful to remember here that questions differ across surveys (cf annexe : table 1).

Figure 1: Percentage of school-aged children by type of schools



Note: Source: Somalia MICS 2006, Nigeria LSMS 2012, Côte d'Ivoire ECVM 2008, Comoros EIM 2004, Mauritania MICS 2012, Gambia DHS 2013, Chad DHS 2004, Burkina Faso EICVM 2009, Senegal ESPS 2011

In those countries, non-formal education institutions such as Quranic schools seem to deliver most of the Arabo-Islamic education. In Somalia, Mauritania and Comoros we find a very significant number of children enrolled in Quranic schools.

Counting "out-of-school" children (an exercise regularly carried out by the *Global Monitoring Report* of UNESCO and the *Out-of-School Children Initiative* of UNICEF) should therefore be put in perspective and account for the special case of these children. In particular, a wide proportion of children considered as "out-of-school" are actually enrolled in Quranic schools. We estimate that it varies between 55% of "out-of-school" children in Somalia, 23% in Côte d'Ivoire and 12% in Nigeria[9]. Section 4.2 highlights the different characteristics of "out-of-school" children, and those enrolled in Quranic schools.

5.1.2 Temporal evolution

To capture the temporal evolution of children only enrolled in Arabo-Islamic education, we need two comparable household surveys in the same country carried out several years apart. Such surveys only exist for Somalia (between 2006 and 2011), Mauritania (between 2007 and 2011), Nigeria (between 2010 and 2012) and for only formal Arabo-Islamic education

[9]Given the different questions asked, estimates in Mauritania (57%), Comoros (60%) and Chad (9%) cannot be directly compared.

in Senegal (between 2005 and 2011) In Mauritania, investment in public education has largely reduced the number of "out-of-school" children (-18%), Quranic-schools (-4%) and in *Mahadra* (-41%) in favor of formal non Arabo-Islamic formal schools (+9%). In Nigeria, the educational situation has worsened between 2010 and 2012 with an increase of "out-of-school" children. The share of children in informal Arabo-Islamic schools and formal Arabo-Islamic schools significantly decreased by respectively 16% and 37%. In Somalia between 2006 and 2011, the share of children enrolled in non-formal Arabo-Islamic schools slightly increased by 0.55%. Finally, in Senegal between 2005 and 2011, the share of children enrolled in franco-arab schools increased from 1.6%, to 3.4% which corresponds to a 47% increase. More recently, the share of Arabo-Islamic education seems to be decreasing in Nigeria and Mauritania, stagnating in Somalia while the share of formal Arabo-Islamic education is increasing in Senegal.

5.2 Which households and which children?

5.2.1 Most excluded populations and enrollment in Arabo-Islamic schools

In this section, we analyze how the proportions of children who belong to excluded social groups vary across our four types of education choice. In particular, we consider the proportion of girls, children from poor households and rural households. Consistent with the typology we suggested in the previous section we focus on: (1) no education of any kind; (2) only non-formal Arabo-Islamic education; (3) formal Arabo-Islamic education; (4) formal non Arabo-Islamic education. Consistent with our sample choice, we only focus on Muslim children and avoid identifying specific characteristics of Muslim children as opposed to the rest of the population.

Table 1: Enrollments pattern in Arabo-Islamic schools across countries: girls, rural households, poor households

	Côte d'Ivoire	Chad	Comoros	Mauritania	Nigeria	Somalia	Burkina Faso	Gambia	Senegal
A: Girl									
Out-of-school	0.44	0.58	0.57	0.53	0.49	0.53	0.51	0.49	0.49
Quranic schools	0.48	0.28	0.46	0.46	0.64	0.49	.	.	.
Formal arabo-islamic	0.50	.	.	0.26	0.50	.	0.34	0.42	0.59
Other formal schools	0.42	0.38	0.47	0.52	0.45	0.45	0.48	0.51	0.51
B: Rural households									
Out-of-school	0.57	0.83	0.93	0.77	0.88	0.61	0.87	0.67	0.78
Quranic schools	0.52	0.79	0.85	0.75	0.87	0.40	.	.	.
Formal arabo-islamic	0.32	.	.	0.73	0.95	.	0.53	0.70	0.53
Other formal schools	0.46	0.45	0.75	0.57	0.64	0.35	0.69	0.46	0.49
Out-of-school	0.57	0.83	0.93	0.77	0.88	0.61	0.87	0.67	0.78
Quranic schools	0.52	0.79	0.85	0.75	0.87	0.40	.	.	.
Formal arabo-islamic	0.32	.	.	0.73	0.95	.	0.53	0.70	0.53
Other formal schools	0.46	0.45	0.75	0.57	0.64	0.35	0.69	0.46	0.49
C: Poor households									
Out-of-school	0.53	0.58	0.65	0.62	0.47	0.65	0.51	0.54	0.55
Quranic schools	0.36	0.52	0.59	0.57	0.38	0.42	.	.	.
Formal arabo-islamic	0.26	.	.	0.42	0.13	.	0.33	0.42	0.19
Other formal schools	0.33	0.26	0.48	0.38	0.26	0.29	0.35	0.38	0.31

Note: Source: cf.Table 1

Except for Nigerian Quranic schools where 64% of the students are girls and except for Senegalese Franco-Arab schools where girls account for 59% of students, there are more boys

than girls enrolled in Arabo-Islamic schools. However, in Côte d'Ivoire, Nigeria, Somalia and Senegal, the Arabo-Islamic education is more favorable to girls than other formal educational structures. On average in the nine countries [10], girls account for 51.4% of out-of school children, 46.8% of children in Quranic schools, 43.5% of children in formal Arabo-Islamic schools and 46.5% of children in other formal schools. These formal Arabo-Islamic schools enroll on average fewer girls than the Quranic schools. We encounter the largest gender discriminations in formal Arabo-Islamic schools in Burkina Faso (34%) and Mauritania (26%) and Quranic schools in Chad (28%). Contrary to popular belief, Arabo-Islamic education is finally supporting a significant number of girls and sometimes has even better gender parity than other formal institutions.

Similarly, children from the two poorest quintiles seem to benefit from Arabo-Islamic education more than the rest of the population. As often documented in the literature, the majority of children with no education belong to households in the two poorest quintiles. Except in Nigeria and in Côte d'Ivoire, children who enroll in Quranic schools also belong to those poorest quintiles in large proportions. They are however on average richer than those who stay out of school.

On average in the 9 countries, the bottom 40% represent respectively 57% of "out-of-school" children, 48% of children in Quranic schools against 36% of children in formal Arabo-Islamic schools and 29% of children in formal non-Arabo-Islamic schools. In Côte d'Ivoire, in Burkina Faso and in Senegal the richest households seem to prefer formal Arabo-Islamic schooling over other types of formal schools. In Nigeria, the poorest households prefer to send their children to formal and non-formal Arabo-Islamic schools rather than leaving their children out of school. Overall, Quranic schools seem to involve an intermediate class between the richest households which chose the formal schools and the poorest who cannot send their children to any educational structure. Formal Arabo-Islamic education concerns mainly households with a level equal or higher income than households enrolled in other formal educational structures.

Rural households also benefit notably from Arabo-Islamic education. Children from rural households constitute the majority of those enrolled in Arabo-Islamic schools. On average in nine countries, children in rural areas represent 70% of the number of children enrolled in Quranic schools and 63% of children enrolled in formal Arabo-Islamic schools. The former mimics the proportion of children from rural households among "out-of-school" children (77%) while the latter contrasts with the 54% rural children in other formal schools.

All in all, non-formal Arabo-Islamic education seems to play a central role in educating a significant part of usually excluded populations, in particular girls and children in rural and poor households. However formal Arabo-Islamic schools seem to exclude those populations as much as other formal schools in the country do.

This descriptive statistical analysis is only indicative of the educational role of Arabo-Islamic schools and their general audience. In the following section we complete it to actually test children's characteristics according to different types of education choice.

[10] We present simple averages that do not account for countries' populations

5.2.2 A comparison of students' characteristics in the different types of education systems

In this section, we analyze the determinants of choices of formal and non-formal Arabo-Islamic education relatively to other educational choices (either staying "out-of-school" or enrolling in other formal schools).

Quranic schools' students vs. "out-of-school" children

Households which chose to send their children to non-formal Arabo-Islamic education rather than to leave them out of any education institutions seem to differ along many dimensions. In Somalia, Mauritania and particularly in Chad, girls are much less likely to be in Quranic schools than out-of school.

Older children are also more likely to go to Quranic schools than to stay "out-of-school" in Somalia and Chad. Elders are also more likely to be enrolled in Quranic schools in Nigeria and Comoros, even after controlling for age. Larger families tend to send their children more to Quranic schools in Somalia, Côte d'Ivoire, Chad and Comoros. Wealthier families also tend to send their children more to Quranic schools in Somalia and Mauritania but not in the other countries. Children in households where the household head went to Arabo-Islamic schools are also more likely to enroll in Quranic schools in Nigeria, Comoros, Mauritania and Chad. Rural households are more likely to leave their children "out-of-school" in Somalia and Côte d'Ivoire but in other countries, seem to make similar choices as urban households do.

Table 2: Comparing characteristics of students in Quranic schools and of "out-of-school" children

Dependent variable: 1 AI schools 0 Out-of-School	Côte d'Ivoire 2008	Chad 2004	Comoros 2004	Mauritania 2011	Nigeria 2012	Somalia 2006	Burkina Faso 2009	Gambia 2013	Senegal 2011
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Girl	1.23	0.33***	1.25	0.69***	1.36	0.78***	0.55***	0.79	1.12
	(0.28)	(0.08)	(0.30)	(0.08)	(0.30)	(0.04)	(0.09)	(0.13)	(0.08)
Age	0.45	2.05***	2.47	1.35	1.87	2.39***	9.98***	6.27***	4.90***
	(0.37)	(0.07)	(2.70)	(0.48)	(1.12)	(0.37)	(5.92)	(1.99)	(1.85)
Fostered child	0.16**	0.85	0.66	0.69	1.00	0.79	0.44	0.90	0.45***
	(0.12)	(0.15)	(0.40)	(0.29)	(.)	(0.12)	(0.24)	(0.12)	(0.09)
Rank among children of the HH	1.04	1.03	0.79**	0.94	0.69***	1.01	1.16**	0.98	0.99
	(0.15)	(0.03)	(0.08)	(0.05)	(0.06)	(0.02)	(0.08)	(0.02)	(0.02)
Number of hh members									
older than 15 yrs old	0.91	0.92***	1.28*	1.00	1.32**	0.97***	0.92*	1.03*	0.99
	(0.10)	(0.03)	(0.16)	(0.06)	(0.14)	(0.01)	(0.04)	(0.02)	(0.02)
Less than 15 yrs old	1.26***	1.04**	1.22***	0.97	1.11*	1.04***	0.98	0.99	0.98
	(0.11)	(0.02)	(0.09)	(0.03)	(0.06)	(0.01)	(0.04)	(0.01)	(0.02)
Asset index (PCA 1st comp.)	1.13	1.10	1.19	1.11**	1.43	1.25***	0.99	1.11*	1.35***
	(0.17)	(0.09)	(0.12)	(0.05)	(0.56)	(0.04)	(0.03)	(0.07)	(0.03)
Women HH head	1.67	1.39*	1.26	1.29**	1.00	1.05	1.14	1.04	1.28**
	(0.92)	(0.27)	(0.39)	(0.13)	(.)	(0.08)	(0.33)	(0.29)	(0.15)
HH head education									
Arabo-islamic education	1.00	4.92***	47.65***	1.86***	5.97***	1.00	1.00	1.06	1.00
	(.)	(0.57)	(25.86)	(0.27)	(1.69)	(.)	(.)	(0.49)	(.)
Formal education	1.61	1.06	19.62***	1.00	1.56	1.07	1.92	0.58	1.79***
	(0.65)	(0.22)	(9.15)	(.)	(0.87)	(0.07)	(0.78)	(0.23)	(0.18)
Rural	0.48*	0.53	0.99	1.05	0.66	0.63***	0.30***	1.18	0.80**
	(0.20)	(0.22)	(0.69)	(0.22)	(0.51)	(0.09)	(0.14)	(0.23)	(0.07)
Pseudo R-squared	0.252	0.227	0.423	0.098	0.253	0.071	0.155	0.232	0.140
Observations	245	4819	704	2674	1081	6818	4017	2729	12115

Note: Source: cf.Table 1. Logit estimations. Robust standard errors in parenthesis, clustered at the region level, region fixed effects. Odds ratio are reported in exponential form.

* p <0.1, ** p <0.05, *** p <0.01.

Even though large differences exist across countries, when households must choose between sending their children to Quranic schools or leaving them out of schools, they seem to prefer to send their boys more than their girls to Quranic schooling and leave their younger children out of school. Richer, larger and urban households also seem to be more likely to send their children to Quranic schools than to leave them out of schools.

Arabo-Islamic schools students vs. students in other types of formal education

Households which choose Arabo-Islamic education (formal or non-formal) rather than other types of formal education seem to differ across countries. In Gambia, Mauritania and Burkina Faso, girls are more likely to be sent to formal non-Arabo-Islamic schools while in Somalia, Nigeria and Chad, they are more likely to be sent to Arabo-Islamic schools. In Côte d'Ivoire, Comoros and Senegal households adopt a similar behavior for their boys and their girls.

In Mauritania and Comoros, younger children and children with no relation with the household head are more likely to be sent to Arabo-Islamic schools. The income effect is very important. Except in Gambia and Senegal, in all countries richer households are less likely to choose solely Arabo-Islamic schooling.

Households where the household head went to Arabo-Islamic schools are also more likely to send their children to Arabo-Islamic schools in Mauritania and Chad. Conversely, for half of the countries in our samples, households where the head of the household attended non-Arabo-Islamic formal schools send their children more to non-Arabo-Islamic formal schools.

Finally, rural households only differ in their educational choices with their urban counterparts in Gambia, Senegal and Chad.

Table 3: Comparing characteristics of students in Arabo-Islamic schools and of students in other formal schools

Dependent variable: 1 AI schools-0 Other formal schools	Côte d'Ivoire 2008	Chad 2004	Comoros 2004	Mauritania 2011	Nigeria 2012	Somalia 2006	Burkina Faso 2009	Gambia 2013	Senegal 2011
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Girl	1.36	1.37*	0.96	0.77***	2.06***	1.28***	0.64***	0.72***	0.97
	(0.30)	(0.24)	(0.12)	(0.05)	(0.31)	(0.07)	(0.10)	(0.08)	(0.07)
Age	0.56	0.98	0.24***	0.13***	0.16***	0.22***	0.11***	1.06	0.25***
	(0.23)	(0.07)	(0.09)	(0.04)	(0.08)	(0.04)	(0.05)	(0.50)	(0.08)
Fostered child	0.90	0.90	2.05**	2.28**	1.00	1.31	1.78	0.96	0.72
	(0.76)	(0.26)	(0.75)	(0.80)	(.)	(0.53)	(0.76)	(0.25)	(0.15)
Rank among children of the HH	1.02	1.03	0.91**	1.08**	0.81***	1.02	1.18**	1.00	0.97
	(0.07)	(0.03)	(0.04)	(0.04)	(0.06)	(0.03)	(0.08)	(0.05)	(0.02)
Number of hh members									
Older than 15 yrs old	1.00	1.00	1.09	0.95	1.19*	0.97	0.91***	1.04	1.01
	(0.04)	(0.03)	(0.06)	(0.03)	(0.12)	(0.03)	(0.03)	(0.03)	(0.01)
Less than 15 yrs old	1.10	1.02	1.07*	0.99	1.13	1.02	1.02	1.00	1.01
	(0.07)	(0.03)	(0.04)	(0.02)	(0.08)	(0.02)	(0.03)	(0.02)	(0.01)
Asset index (PCA 1st comp.)	0.75***	0.88***	0.86**	0.76***	0.38***	0.81***	0.85***	0.98	1.07***
	(0.08)	(0.03)	(0.06)	(0.04)	(0.14)	(0.02)	(0.05)	(0.09)	(0.02)
Women HH head	0.96	0.96	0.78	0.90	1.00	0.95	0.69*	0.85	0.93
	(0.19)	(0.28)	(0.15)	(0.09)	(.)	(0.06)	(0.15)	(0.18)	(0.08)
HH head education									
Arabo-islamic education	1.00	2.63***	2.44	1.94***	1.56	1.00	1.00	1.40	1.00
	(.)	(0.42)	(1.33)	(0.23)	(0.85)	(.)	(.)	(0.49)	(.)
Formal education	1.16	0.27***	0.81	1.00	0.26***	0.65***	0.77	0.46***	0.74***
	(0.30)	(0.07)	(0.42)	(.)	(0.10)	(0.05)	(0.27)	(0.13)	(0.06)
Rural	0.62	7.11***	1.54	0.99	1.17	0.82	0.58	1.97**	1.25***
	(0.24)	(3.62)	(0.45)	(0.13)	(0.61)	(0.12)	(0.26)	(0.54)	(0.10)
Pseudo R-squared	0.105	0.343	0.165	0.192	0.211	0.159	0.071	0.195	0.042
Obs	1828	3311	2501	6406	1375	8346	3194	3343	15358

Note: Source: cf.Table 1. Logit estimations. Robust standard errors in parenthesis, clustered at the region level, region fixed effects. Odds ratios are reported in exponential form.

* p <0.1, ** p <0.05, *** p <0.01.

All in all, the child's age, the household's wealth and the education level of the household head seem to significantly impact the choice of Arabo-Islamic education over non-Arabo-Islamic formal education. Children's genders have different impact across countries.

Formal Arabo-Islamic school students vs students in non-formal Arabo-Islamic schools

Differences across households which choose formal Arabo-Islamic education rather than only Quranic school are also informative. In Nigeria and Côte d'Ivoire, places with both formal Arabo-Islamic education as well as non-formal are rare, as a result our samples shrink and only a few variables seem to explain this choice significantly. In Nigeria, households which make those two different types of choices have similar observable characteristics. In Côte d'Ivoire, birth order and the number of adults within the households both positively impact the choice of formal Arabo-Islamic education. In Mauritania, boys, fostered children as well as children in wealthier households or households with a household head with Arabo-Islamic schooling are more likely to enroll in formal Arabo-Islamic schools.

Table 4: Comparing characteristics of students in formal AI schools and of students in non-formal AI schools

Dependent variable: 1 AI formal schools - 0 non-formal AI schools	Nigeria 2012	Côte d'Ivoire 2008	Mauritania 2012
	(1)	(2)	(3)
Girl	1.09	7.60	0.21***
	(0.26)	(19.26)	(0.11)
Age	1.49	5.30	8.90***
	(1.18)	(18.69)	(6.08)
Fostered child	1.00	1.00	17.39**
	(.)	(.)	(24.92)
Rank among children of the HH	1.74**	1.04	1.00
	(0.41)	(0.58)	(0.31)
Number of hh members			
Older than 15 yrs old	0.67	0.52**	0.60
	(0.17)	(0.15)	(0.20)
Less than 15 yrs old	1.13	0.87	1.16
	(0.09)	(0.35)	(0.21)
Asset index (1st component of PCA)	2.19	0.54	1.89***
	(4.44)	(0.53)	(0.21)
Women HH head	1.00	115.77**	1.49
	(.)	(225.04)	(1.03)
HH head education			
Arabo-islamic education	0.48	1.00	0.25***
	(0.48)	(.)	(0.13)
Formal education	0.64	0.21	1.00
	(0.78)	(0.26)	(.)
Rural	1.00	5.91	2.10
	(.)	(12.34)	(2.67)
Pseudo R-squared	0.193	0.505	0.252
Obs	147	44	1273

Note: Source: cf.Table 1. Logit estimations. Robust standard errors in parenthesis, clustered at the region level, region fixed effects. Odds ratio are reported in exponential form.

* p <0.1, ** p <0.05, *** p <0.01.

As a robustness test we make sure that our regressions refer to actual choices of the parents by restricting the sample to geographical clusters where there are children enrolled in the two types of education we test. Results are presented in tables A2 to A4. They don't differ significantly from the ones presented in this section.

Similarly we test whether considering a multinomial logit instead of repeated logits significantly changes the results we obtain. Results are presented in A5. They are again similar to the ones presented in this section. We prefer the repeated logit estimations that allow us to test more specifically different pairs of choices, even though there isn't a common reference present in all those pairs.

5.3 Reasons for Arabo-Islamic schooling

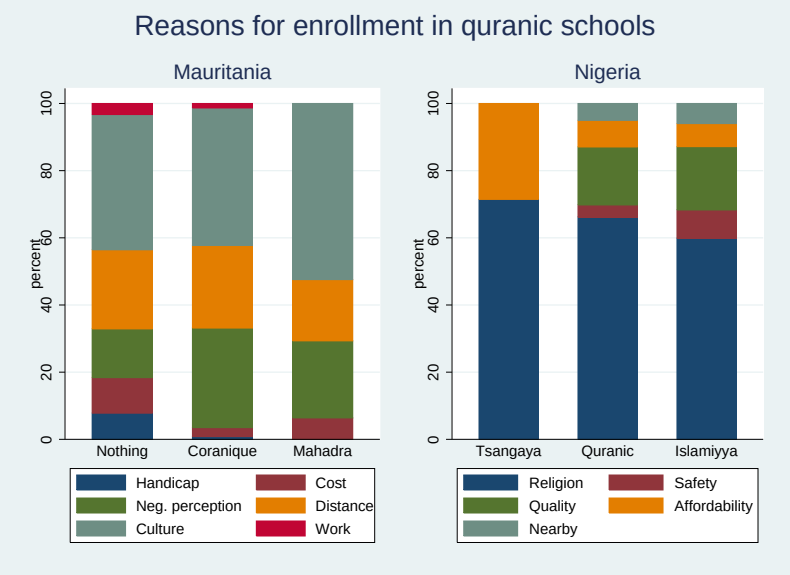
5.3.1 Parents' justification for their choice

In this section we document parents' self-reported reasons for choosing Arabo-Islamic schools.

Household surveys in Mauritania and Nigeria contain questions about parents' reasons for enrolling their children in Arabo-Islamic schools. This is particularly useful to assess the respective share of religion and personal values on the one hand and other motivations (such as direct and opportunity costs, income or expected returns and school quality perceptions) on the other hand, in their choice of Arabo-Islamic schools. In Mauritania, culture, unsuited educational supply, and negative perception of formal schools account for 95% of justifications given by parents who chose Quranic schools or Mahadra for their children. Culture and cost

of schooling are more important for parents who chose Mahadras than for those who chose Quranic schools. Cost of schooling seems to matter more for parents who decide to leave their children out of school than for parents who chose to enroll their children in Arabo-Islamic schools. In contrast, negative perceptions of formal schools seem to matter relatively more, for the latter. Keeping in mind that the answer key is different in Nigeria[11], religious and moral reasons seem to matter particularly for Nigerian households which chose both formal and non-formal Arabo-Islamic schools. Cost of schooling justify choices of *Tsangaya* while quality matters more for parents who enroll their children in *Islamiyya* and standard Quranic schools[12].

Figure 2: Culture and religion are the two most important self-reported reasons for schooling choices



Cultural and religious reasons seem to be the most important reasons put forward by parents to justify Arabo-Islamic schooling. Unsuited or low-quality formal educational supply seems to matter as well. Cost of formal schooling is the third reason given to justify Arabo-Islamic schooling[13].

These results are important since they give a more precise picture of parents' motivations. Nonetheless, parents may not be willing to share all their motivations. Besides, it is difficult to determine which of the different reasons they give are binding. We now turn to a revealed preference analysis that alleviates concerns from inaccurate self-reported justifications and

[11]In the MICS Mauritania (2011) the question is "Why has (Name) never been to formal school?", in the DHSEdData from Nigeria (2010), children from different type of Arabo-Islamic schools are asked why they chose to enroll in this type of school

[12]*Tsangaya* are mobile non-formal Arabo-Islamic schools while *Islamiyya* include the formal curriculum and have a schedule comparable to that of formal schools. (Antoninis, 2014)

[13]Most of the surveys lack information on costs of different schools. However, the LSMS Nigeria survey contains this information, and shows that households which choose formal education spend on average eight times more for their child's education than those that chose Quranic schools only. The cost of Quranic education seems to be very small, but not nil.

helps identify some determinants to enrollment in Arabo-Islamics school rather than non-Arabo-Islamic formal schools.

5.3.2 Revealed preferences

To implement the revealed preference analysis we use panel data in the Nigerian context and demonstrate the importance of perceived quality of education in educational choices. Our analysis focus on two self-reported reasons for choosing Arabo-Islamic school over non-Arabo-Islamic schools. Those reasons suggest that households are not always making their first best choice when enrolling their children in Arabo-Islamic schools and identify policy levers on which policy makers could act upon to help them access their preferred options. Beyond religious and cultural reasons often put forward by parents to justify enrollment in Quranic schools they mention the cost and lack of quality of non-Arabo-Islamic formal schooling as barriers to enrollment in those schools.

We show that transitions towards formal non-Arabo-Islamic schools come along with a perceived improvement of non-Arabo-Islamic formal schools, but not as a consequence of an increase in household income. We present suggestive evidence that perceived improvement in quality of non-Arabo-Islamic formal schools leads to higher enrollment in these schools for poor households. This suggests that other factors may import in a proportion that is maybe underestimated in parents' reported reasons.

We first analyze the impact of non-Arabo-Islamic schooling cost on the choice of this type of school. To that end, we analyze how transitions towards this type of school are associated with income variation, as proxied by expenses. To account for the potential reverse correlation issue, we instrument income variation, by the consequences of economic shocks on households' consumption. Column (1) of table 5 reveals that for the whole population transitions toward non-Arabo-Islamic formal schools seem associated with an increase in households' income. Column (2) presents the first step of our instrumental variable approach. It shows how an economic shock negatively affects household consumption. Given the level of significance of the instrument, we rule out concern of under-identification. Columns (3) and (4) reveal that the effect identified in column (1) seems driven by reverse causality issues, namely that enrollment in non-Arabo-Islamic formal schools is more costly than enrollment in Arabo-Islamic schools which drives households expenses up. Columns (4) to (7) reproduces the same analysis for the population of children in poor households both in 2010 and 2012. It confirms that the income channel does not seem central to households' decision-making process. As a consequence, we turn to the analysis of the other reason often self-reported by households, namely the quality of non-Arabo-Islamic formal schools.

Table 5: The income channel

Sample	All				Poor both in 2010 and 2012			
	(1) F.E.	(2) F.E.**	(3) Reduced-Form	(4) IV	(5) F.E.	(6) F.E.**	(7) Reduced-Form	(8) IV
Nb. members 15+	0.002	−0.003	0.001	0.001	0.060	0.005	0.062	0.059
	(0.010)	(0.012)	(0.010)	(0.010)	(0.042)	(0.029)	(0.042)	(0.043)
Nb. members 15-	0.006	−0.004	0.005	0.005	0.050	0.003	0.057*	0.056
	(0.008)	(0.008)	(0.007)	(0.008)	(0.034)	(0.024)	(0.034)	(0.036)
Log. deflated exp.*	0.063*			−0.064	0.072			0.525
	(0.032)			(0.298)	(0.114)			(0.498)
Economic shock*		−0.381***	0.024			−0.354***	−0.186	
		(0.126)	(0.112)			(0.120)	(0.169)	
Observations	2142	2142	2195	1536	461	461	461	298

* p <0.1, ** p <0.05, *** p <0.01.

Note: Dependent variable is a dummy equal 1 when children are enrolled in non-Arabo-Islamic formal school and 0 when they are enrolled in Arabo-Islamic schools. The sample is restricted to children aged 6 to 9 in 2010. **First step. In columns (2) and (6) the dependent variable is the log of household income * Economic shock refers to robbery in column (2) and loss of an important contact in column (6)

Table 6 reports estimations of equation 3. Column 1 shows how a perceived improvement in education is associated with more enrollment in formal non-Arabo-Islamic rather than Arabo-Islamic schools. Similarly when a household's income increases children are more likely to enroll in formal non-Arabo-Islamic schools rather than in Arabo-Islamic schools. Column (2) shows that for the poorest households (in the two poorest quintiles) only, perceived improvement in education matters. In this column we restrict the sample to households that were poor in 2010 and in 2012, which explains why the sample size is less than two fifth of the sample in column (1). Column (3) confirms this result. We restrict there the sample to households whichse income did not change significantly between 2010 and 2012 (i.e. either remain in the two poorest quintiles or in the three richest ones). Hence the interaction term between the poverty dummy and the dummy indicating an improvement in perceived quality, only captures the impact of the variation of perceived quality of education. It does not capture the effect of a fall in poverty, keeping perceived quality of education constant. Columns (4) to (7) confirm that those results are not driven solely by a perceived improvement of education quality following one school's opening.

Table 6: The school perception channel

	All villages			At least a formal non quranic school both in 2010 and 2012			
	(1) All	(2) Poor	(3) Steady income	(4) Poor	(5) Poor and no no formal	(6) Steady income	(7) Steady income
Nb. members 15+	0.005	0.058	0.002	0.069	0.067	0.004	0.003
	(0.008)	(0.054)	(0.008)	(0.060)	(0.062)	(0.010)	(0.010)
Nb. members 15-	0.005	0.043	0.005	0.036	0.035	0.006	0.006
	(0.004)	(0.029)	(0.004)	(0.032)	(0.033)	(0.006)	(0.006)
Perceived prim. quality improvement	0.067*	0.139*	0.014	0.187***	0.169**	0.012	0.013
	(0.039)	(0.072)	(0.010)	(0.067)	(0.074)	(0.011)	(0.011)
Log. deflated exp.	0.061*	0.083		0.103	0.102		
	(0.031)	(0.098)		(0.097)	(0.098)		
Perceived prim. quality improvement poor			0.126*			0.170**	0.159*
			(0.074)			(0.081)	(0.090)
Observations	2034	445	1616	333	305	1372	1336

* p <0.1, ** p <0.05, *** p <0.01.

As we cannot build any instrument that would predict improvement in perceived quality of non-Arabo-Islamic formal schools and would not be correlated with the residual in the regression of enrollment on perceived quality, we try to rule out other channels that might spur our analysis. In particular, both the conceptual framework as well as the self-reported reasons for enrollment in Arabo-Islamic schools identify wealth as an important determinant. Table A1 column (1) shows that there might be a spurious correlation between wealth and perceived improvement in non-Arabo-Islamic formal schools. We might therefore identify both the quality and income effect. However, columns (2) and (3) suggest that this concern is lower for poor people, for whom the perceived quality of education did matter more. Indeed, the coefficient on income in the regression of perceived improvement in non-Arabo-Islamic formal school quality isn't significant when we restrict the sample to this population.

Table 7: Robustness checks (Do we disentangle the income and quality channels?)

Dependent variable:	Improvement in non AI formal schools			Informal AI (1) vs. out-of-school(0)
	(1)	(2)	(3)	(4)
	All	Poor	Poor households with at least a formal school	Poor
Nb. members 15+	−0.034	0.031	−0.034	−0.047
	(0.030)	(0.090)	(0.088)	(0.054)
Nb. members 15-	−0.020	0.053	−0.025	−0.011
	(0.026)	(0.086)	(0.081)	(0.065)
Log. deflated exp.*	0.254**	−0.066	0.066	−0.031
	(0.116)	(0.255)	(0.241)	(0.079)
Perceived prim. quality improvement				−0.011
				(0.054)
Observations	2034	445	333	457

* p <0.1, ** p <0.05, *** p <0.01.

Note: Fixed effects estimation. Standard errors are clustered at the village level to account for survey design. *expenses are instrumented with an economic shock in column (5)

Finally, as a robustness test, Table A1 column (4) confirms that perceived improvement in non-Arabo-Islamic school quality does not predict enrollment in Arabo-Islamic schools . Indeed, the coefficient on improvement in school quality in the regression that estimate equation (2) with, as dependent variable, a dummy that equals one when the child is enrolled in Arabo-Islamic schools and 0 when she is out of school isn't significant.

All in all this section shows that beyond the two most important reasons put forward spontaneously by parents to justify their choices of Arabo-Islamic schooling, other determinants as school perception and potentially wealth or education cost may play an important role in their decision.

6 Discussion

The choice of an educational institution is one of the most important decisions parents can make for their children. This choice is critical for the future of not only their children but also the household as a whole. This choice between different education alternatives appears also as a key issue for the formation of human capital of a nation and its level of social stratification. In the specific context of sub-Saharan Africa, the Arabo-Islamic education choice is particularly poorly quantified and qualified. Questions like how many children are concerned, what are the characteristics of households and children concerned, and what are the reasons for Arabo-Islamic education remain unanswered in most sub-Saharan African countries.

To address these issues, we first develop a typology in line with data availability to distinguish formal Arabo-Islamic education institutions (madrasahs, mahadras, medersas, integrated Quranic schools, franco-arab schools) recognized by the States as schools and non-formal Arabo-Islamic education institutions (Quranic schools) which teach mainly religious subjects. After an inventory of existing data, we developed a methodology to obtain

nationally representative data on formal and non-formal Arabo-Islamic education choice across African countries. We rely on representative household surveys from 9 countries (Nigeria, Côte d'Ivoire, Mauritania, Gambia, Burkina Faso, Senegal, Chad, Somalia and Comoros) to quantify the number of children actually enrolled in Arabo-Islamic education and its temporal evolution.

Our results show that a significant number of children are educated only in Arabo-Islamic institutions but that the situation varies widely between the 9 countries for which data are available(from 3% to 30%). The Arabo-Islamic education appears mainly driven by non-formal Arabo-Islamic education structures (Quranic schools) rather than by formal Arabo-Islamic education structures recognized by States. We show that a large number of recorded "out-of-school" children in primary school age are in fact enrolled in Quranic schools (between 12% and 55%). During the last decade and in the four countries where two successive surveys are available, the Arabo-Islamic education appears to be decreasing in Nigeria and Mauritania, stagnating in Somalia and increasing for formal Arabo-Islamic school in Senegal.

Our analysis of characteristics of households and children concerned show significant differences between households choosing no education of any kind; non-formal Arabo-Islamic education and nothing else; formal Arabo-Islamic education and other formal schools education. Quranic schools appear as an important vector of knowledge transmission for the usually most excluded populations like girls, the poorest households and rural areas, but the most excluded population are even more often "out-of-school". However formal Arabo-Islamic schools seem to exclude vulnerable populations as much as other formal schools in the country do. Those results seem to be robust to a multivariate analysis.

When parents are asked why they choose Arabo-Islamic education for their children, they first mention cultural and religious reasons and then the lack of quality or the cost of formal education provision. The analysis of revealed preferences with panel data in Nigeria, shows how parents are sensitive to formal education provision's quality. So when they perceived a change in formal education quality, the poorest households change their educational choice according to Arabo-Islamic education institution. This complements the reasons given by parents spontaneously and that stress religious and personal values.

Our results have several policy implications: First, they emphasize the importance of having sound data and surveys to quantify and qualify this specific question. Indeed, the children enrolled only in Quranic schools are different from those who do not receive any education and from those enrolled in formal education. Any intervention on "out-of-school" children in sub-Saharan countries needs to address Quranic school students separately, and the first steps in this direction entail counting them, analyzing their characteristics and the determinants of their educational choice. These particular children will require targeted interventions which are different from actions on children without any education institution. Strategies attempting to facilitate transitions from Quranic schools to formal schools (working on complementarities) or reforms to formalize them need to address the differences between households. Working with Arabo-Islamic education institutions could be a way to improve the level of students who are supported while meeting the demands of the moral and religious households. They should also account for, not ignore, the importance of school quality perception in parent's decisions to combine these two types of schooling. This could be beneficial in increasing human capital and social inclusion of African countries. Consid-

ering the important variation between countries in our countries, it appears however to be context-specific on this issues and to integrate political and social issues.
On the research side, our paper show how important is it to include more specific questions on different types of education choice in household surveys and other Labor surveys. Collecting exhaustive data on the supply side (especially the non-formal Arabo-Islamic schools) appears important for researchers but also for education ministry and international organizations. Better data could lead to new research questions to better know the household demand for religious and secular knowledge, the drivers of perceived quality or the economic and social returns to Arabo-Islamic education.

7 Appendix

Table A1: First step IV

Dependent variable:	Improvement in non AI formal schools
	(1)
	All
Nb. members 15+	0.043
	(0.028)
Nb. members 15-	0.032
	(0.025)
Economic shock	−0.247***
	(0.082)
Observations	992

* p <0.1, ** p <0.05, *** p <0.01.

Note: Fixed effects estimation. Standard errors are clustered at the village level to account for survey design. Economic shock refers to the loss of an important contact

Figure 3: Detailed description of the datasets

Country	Survey	Year	Questions asked	Possible answers
Somalie	MICS	2011	During this school year (2010-2011) was (name) enrolled in kindergarten or formal school?, During this school year (2010-2011) was (name) enrolled in quranic school?	Yes/No
Somalie	MICS	2006	During this year in which class was (name) enrolled ?	Kindergarten, Primary, Secondary, Higher education, Quranic, Non-formal
Nigéria	LSMS	2012	In which class were you enrolled in 2012-2013?	NONE, N1, N2, P1, P2, P3, P4, P5, P6, JS1, JS2, JS3, SS1, SS2, SS3, Lower 6, Upper 6, 1st degree, higher degree, **Quranic, integrated Quranic,** Adult education adulte, Teacher training, Vocational/technical
Côte d'Ivoire	Enquête sur les Conditions de Vie des Ménages (ECVM)	2008	In what type of school are you enrolled in 2007/2008?	General, Technic, Professionnal, **Franco-arab, Quranique**, Other
Comoros	Enquête intégrée auprès des ménages (EIM)	2004	Has [name] been enrolled in quranic school? Has [name] ever been to school [including kinder garten & formation training]?	Yes/No
Mauritania	MICS	2011	What is the highest level of study attained by (name)?	Kinder garted, primary, General Secondary, Secondary technical/professionnal, Higher, **Quranique, Mahadra**, NSP
Gambia	DHS	2013	During this school year, what level and grade is (NAME) attending?	Pre-school, Pre-school (Madrassa), Primary, Primary (Madrassa), Secondary, Secondary (Madrassa)
Chad	DHS	2004	What is the highest education level you ever attained: primary, secondary or higher?	**Quranic school only,** Primary, Secondary, Higher, Professionnel niv. Secondaire, Professionnel niv. Superieur
Burkina Faso	Enquête Intégrale sur les Conditions de Vie des Ménages (EICVM)	2009	What type of school was (name) enrolled in during the 2008 - 2009 school year?	Public, Secular private, Catholic private, Protestant Private **Franco-arab/Medersa**

Figure 4: Robustness - multinomial logit

Country	Survey	Year	Questions asked	Possible answers
Somalie	MICS	2011	During this school year (2010-2011) was (name) enrolled in kindergarten or formal school?, During this school year (2010-2011) was (name) enrolled in quranic school?	Yes/No
Somalie	MICS	2006	During this year in which class was (name) enrolled ?	Kindergarten, Primary, Secondary, Higher education, Quranic, Non-formal
Nigéria	LSMS	2012	In which class were you enrolled in 2012-2013?	NONE, N1, N2, P1, P2, P3, P4, P5, P6, JS1, JS2, JS3, SS1, SS2, SS3, Lower 6, Upper 6, 1st degree, higher degree, **Quranic, integrated Quranic,** Adult education adulte, Teacher training, Vocational/technical
Côte d'Ivoire	Enquête sur les Conditions de Vie des Ménages (ECVM)	2008	In what type of school are you enrolled in 2007/2008?	General, Technic, Professionnal, **Franco-arab, Quranique**, Other
Comoros	Enquête intégrée auprès des ménages (EIM)	2004	Has [name] been enrolled in quranic school? Has [name] ever been to school [including kinder garten & formation training]?	Yes/No
Mauritania	MICS	2011	What is the highest level of study attained by (name)?	Kinder garted, primary, General Secondary, Secondary technical/professionnal, Higher, **Quranique, Mahadra**, NSP
Gambia	DHS	2013	During this school year, what level and grade is (NAME) attending?	Pre-school, Pre-school (Madrassa), Primary, Primary (Madrassa), Secondary, Secondary (Madrassa)
Chad	DHS	2004	What is the highest education level you ever attained: primary, secondary or higher?	**Quranic school only,** Primary, Secondary, Higher, Professionnel niv. Secondaire, Professionnel niv. Superieur
Burkina Faso	Enquête Intégrale sur les Conditions de Vie des Ménages (EICVM)	2009	What type of school was (name) enrolled in during the 2008 - 2009 school year?	Public, Secular private, Catholic private, Protestant Private **Franco-arab/Medersa**

Table A2: Robustness - two types of schooling in cluster

Dependent variable: 1 AI schools 0 Out-of-School	Côte d'Ivoire 2008	Chad 2004	Comoros 2004	Mauritania 2011	Nigeria 2012	Somalia 2006	Burkina Faso 2009	Gambia 2013	Senegal 2011
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Girl	0.62	0.33***	1.27	0.68***	1.39	0.78***	0.61***	0.79	1.12
	(0.28)	(0.08)	(0.37)	(0.10)	(0.30)	(0.04)	(0.08)	(0.13)	(0.08)
Age	1.63	2.05***	2.52	1.39	1.89	2.37***	10.10***	6.79***	4.89***
	(1.59)	(0.07)	(3.16)	(0.52)	(1.17)	(0.36)	(6.03)	(2.08)	(1.85)
Fostered child	1.00	0.85	0.19**	0.46**	1.00	0.79	0.47	0.91	0.45***
	(.)	(0.15)	(0.15)	(0.17)	(.)	(0.12)	(0.24)	(0.12)	(0.09)
Rank among children of the HH	1.12	1.03	0.76**	0.93	0.71***	1.00	1.13*	0.97	0.98
	(0.26)	(0.03)	(0.10)	(0.05)	(0.06)	(0.02)	(0.08)	(0.02)	(0.02)
Number of hh members									
older than 15 yrs old	0.86	0.92***	1.26	0.99	1.28**	0.97**	0.95	1.04**	1.00
	(0.12)	(0.03)	(0.21)	(0.06)	(0.13)	(0.01)	(0.04)	(0.02)	(0.02)
Less than 15 yrs old	1.30***	1.04**	1.33***	0.96	1.10**	1.04***	0.98	1.00	0.98
	(0.13)	(0.02)	(0.11)	(0.03)	(0.06)	(0.01)	(0.04)	(0.01)	(0.02)
Asset index (PCA 1st comp.)	0.96	1.10	1.19	1.11**	1.43	1.25***	1.00	1.11*	1.35***
	(0.17)	(0.09)	(0.17)	(0.05)	(0.57)	(0.04)	(0.02)	(0.07)	(0.03)
Women HH head	2.32	1.39*	1.54	1.30***	1.00	1.06	1.08	1.08	1.28**
	(1.92)	(0.27)	(0.43)	(0.13)	(.)	(0.08)	(0.29)	(0.29)	(0.15)
HH head education									
Arabo-islamic education	1.00	4.92***	29.49***	1.74***	6.02***	1.00	1.00	1.09	1.00
	(.)	(0.57)	(16.16)	(0.26)	(1.74)	(.)	(.)	(0.50)	(.)
Formal education	1.23	1.06	11.79***	1.00	1.51	1.07	2.02*	0.59	1.80***
	(0.93)	(0.22)	(6.00)	(.)	(0.85)	(0.07)	(0.77)	(0.24)	(0.18)
Rural	0.55	0.53	2.30	1.02	0.64	0.64***	0.34**	1.20	0.80**
	(0.37)	(0.22)	(1.86)	(0.14)	(0.53)	(0.09)	(0.15)	(0.22)	(0.07)
Pseudo R-squared	0.185	0.227	0.412	0.090	0.250	0.069	0.119	0.232	0.141
Observations	113	4819	455	2298	1081	6782	3748	2722	12115

Note: We restrict sample to clusters where there are both students enrolled in AI schools and out-of-school children

* p <0.1, ** p <0.05, *** p <0.01.

Table A3: Robustness - two types of schooling in cluster

Dependent variable: 1 AI schools-0 Other formal schools	Côte d'Ivoire 2008	Chad 2004	Comoros 2004	Mauritania 2011	Nigeria 2012	Somalia 2006	Burkina Faso 2009	Gambia 2013	Senegal 2011
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Girl	1.29	1.37	0.97	0.77***	2.05***	1.28***	0.65***	0.73***	0.97
	(0.31)	(0.26)	(0.12)	(0.05)	(0.31)	(0.08)	(0.11)	(0.08)	(0.07)
Age	0.44*	0.94	0.24***	0.13***	0.16***	0.22***	0.11***	0.99	0.24***
	(0.19)	(0.05)	(0.09)	(0.03)	(0.08)	(0.04)	(0.05)	(0.46)	(0.08)
Fostered child	1.00	1.06	2.05**	2.29**	1.00	1.22	1.77	0.97	0.72
	(.)	(0.36)	(0.74)	(0.81)	(.)	(0.49)	(0.76)	(0.25)	(0.15)
Rank among children of the HH	1.03	1.02	0.92*	1.08**	0.84**	1.01	1.17**	0.99	0.97
	(0.07)	(0.03)	(0.04)	(0.04)	(0.07)	(0.02)	(0.08)	(0.05)	(0.02)
Number of hh members									
Older than 15 yrs old	1.00	1.01	1.08	0.95	1.15	0.98	0.92**	1.03	1.01
	(0.05)	(0.04)	(0.06)	(0.03)	(0.11)	(0.03)	(0.03)	(0.03)	(0.01)
Less than 15 yrs old	1.09	1.01	1.06	0.99	1.12	1.02	1.02	1.01	1.01
	(0.08)	(0.03)	(0.04)	(0.02)	(0.08)	(0.02)	(0.03)	(0.02)	(0.01)
Asset index (PCA 1st comp.)	0.75**	0.88***	0.86**	0.76***	0.39***	0.81***	0.84***	0.99	1.07***
	(0.09)	(0.03)	(0.06)	(0.04)	(0.14)	(0.02)	(0.05)	(0.09)	(0.02)
Women HH head	1.01	0.89	0.77	0.90	1.00	0.95	0.71	0.85	0.93
	(0.22)	(0.24)	(0.15)	(0.09)	(.)	(0.06)	(0.16)	(0.19)	(0.08)
HH head education									
Arabo-islamic education	1.00	2.63***	2.44	1.94***	1.56	1.00	1.00	1.37	1.00
	(.)	(0.45)	(1.33)	(0.23)	(0.85)	(.)	(.)	(0.50)	(.)
Formal education	1.19	0.29***	0.81	1.00	0.26***	0.66***	0.79	0.46***	0.74***
	(0.33)	(0.08)	(0.42)	(.)	(0.10)	(0.05)	(0.28)	(0.13)	(0.06)
Rural	0.57	4.67***	1.55	0.99	1.14	0.79*	0.57	1.93**	1.25***
	(0.24)	(2.05)	(0.45)	(0.13)	(0.61)	(0.11)	(0.25)	(0.52)	(0.10)
Pseudo R-squared	0.105	0.288	0.164	0.192	0.208	0.159	0.071	0.164	0.042
Obs	1785	3117	2501	6406	1375	8282	3192	3289	15358

* p <0.1, ** p <0.05, *** p <0.01.

Note: We restrict sample to clusters where there are both students enrolled in AI schools and children enrolled in other formal schools

Table A4: Robustness - two types of schooling in cluster

Dependent variable: 1 AI formal schools - 0 non-formal AI schools	Nigeria 2012	Côte d'Ivoire 2008	Mauritania 2012
	(1)	(2)	(3)
Girl	1.09	7.60	0.21***
	(0.26)	(19.26)	(0.11)
Age	1.49	5.30	8.90***
	(1.18)	(18.69)	(6.08)
Fostered child	1.00	1.00	17.39**
	(.)	(.)	(24.92)
Rank among children of the HH	1.74**	1.04	1.00
	(0.41)	(0.58)	(0.31)
Number of hh members			
Older than 15 yrs old	0.67	0.52**	0.60
	(0.17)	(0.15)	(0.20)
Less than 15 yrs old	1.13	0.87	1.16
	(0.09)	(0.35)	(0.21)
Asset index (1st component of PCA)	2.19	0.54	1.89***
	(4.44)	(0.53)	(0.21)
Women HH head	1.00	115.77**	1.49
	(.)	(225.04)	(1.03)
HH head education			
Arabo-islamic education	0.48	1.00	0.25***
	(0.48)	(.)	(0.13)
Formal education	0.64	0.21	1.00
	(0.78)	(0.26)	(.)
Rural	1.00	5.91	2.10
	(.)	(12.34)	(2.67)
Pseudo R-squared	0.193	0.505	0.252
Obs	147	44	1273

* p <0.1, ** p <0.05, *** p <0.01.

Note: We restrict sample to clusters where there are both students enrolled in AI schools and children enrolled in non formal AI schools

Table A5: Robustness - mlogit

	Gambia	Somalia	Nigeria 2012	Côte d'Ivoire 2008	Comores	Mauritania 2011	Chad	Burkina Faso
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Girl	0.80**	1.61***	1.56***	1.12	1.17	1.16*	2.97***	1.10
	(0.07)	(0.11)	(0.12)	(0.23)	(0.22)	(0.09)	(0.16)	(0.08)
Age	0.15***	0.10***	0.07***	0.46	0.08***	0.09***	0.46***	0.01***
	(0.05)	(0.03)	(0.02)	(0.29)	(0.04)	(0.03)	(0.02)	(0.00)
Asset index (1st component of PCA)	0.82***	0.65***	0.40***	0.78**	0.67***	0.68***	0.85***	0.93**
	(0.04)	(0.02)	(0.11)	(0.09)	(0.07)	(0.04)	(0.05)	(0.03)
HH head education								
Arabo-islamic education	0.96		0.35***		0.13***	1.01	0.55***	
	(0.31)		(0.14)		(0.04)	(0.14)	(0.11)	
Formal education	0.69**	0.59***	0.19***	0.95	0.13***		0.27***	0.40***
	(0.10)	(0.03)	(0.05)	(0.35)	(0.05)		(0.07)	(0.06)
Formal_AI_schools								
Girl	0.69***		1.92***	1.50		0.32**		0.65***
	(0.09)		(0.45)	(0.38)		(0.17)		(0.10)
Age	0.92		0.33	0.64		1.03		0.13***
	(0.37)		(0.23)	(0.34)		(0.87)		(0.05)
Asset index (1st component of PCA)	0.95		0.56	0.74**		1.00		0.88**
	(0.07)		(0.40)	(0.10)		(0.13)		(0.05)
HH head education								
Arabo-islamic education	1.25		0.75			0.68		
	(0.46)		(0.66)			(0.37)		
Formal education	0.46***		0.35	1.25				0.75
	(0.13)		(0.37)	(0.53)				(0.27)
Quranic_schools								
Girl		1.29***	2.07***	1.22	0.99	0.81***	1.06	
		(0.07)	(0.32)	(0.34)	(0.12)	(0.05)	(0.25)	
Age		0.23***	0.10***	0.46	0.25***	0.13***	0.92	
		(0.05)	(0.05)	(0.26)	(0.10)	(0.03)	(0.05)	
Asset index (1st component of PCA)		0.81***	0.52**	0.76**	0.86**	0.75***	0.91***	
		(0.02)	(0.16)	(0.09)	(0.06)	(0.04)	(0.03)	
Formal education		0.64***	0.26***	1.13	0.87		0.31***	
		(0.05)	(0.12)	(0.39)	(0.45)		(0.08)	
HH head education								
Arabo-islamic education			2.11*		2.52*	1.94***	2.66***	
			(0.89)		(1.37)	(0.19)	(0.34)	
Other_non_formal_education								
Girl		1.20						0.59
		(0.57)						(0.21)
Age		0.42						0.12
		(0.56)						(0.18)
Asset index (1st component of PCA)		0.49***						0.93
		(0.08)						(0.06)
Formal education		0.17*						1.17
		(0.17)						(0.70)
Pseudo R-squared	0.163	0.141	0.244	0.130	0.230	0.182	0.287	0.166
Obs	5448	11331	2690	1980	2764	7281	7263	7163

* p <0.1, ** p <0.05, *** p <0.01.

Note: We restrict sample to clusters where there are both students enrolled in AI schools and children enrolled in non formal AI schools

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