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Articles

International Child Sponsorship Improves School Performance: Evidence from Goma (DRC)

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Abstract

This paper provides new evidence on the impact on educational attainment of an international child support (ICS) program, implemented in ten primary schools located in the peri-urban districts of the city of Goma (Democratic Republic of Congo). Using original micro data from a sample of 309 children (treated, 121; control, 188), we explore, through a difference-in-differences approach, whether the ICS program, which reduces the structural uncertainty faced by the targeted pupils and their families, impacts on a broad set of alternative educational outcomes—namely, performance scores in four different subjects (civic education and religion, French languages, national languages and mathematics), total score, failure and school drop-out rates. The results show that sponsored children report lower drop-out and failure rates in comparison to their control peers and that they succeed in catching up in all subjects in two school years. Results are robust to the implementation of a coarsened exact matching procedure, exploiting the data structure to produce unbiased estimates along with bounded ex-post balancing.

Keywords: international child support, education, school performance, matching estimator
JEL classification: C93, D04, I25

1. Introduction

Education has been recognized as a basic human right, a safeguard for human dignity and foundation of freedom, justice and peace (United Nations, 1948), since it produces a number of positive effects on individuals, communities and society as a whole. The short- and long-term benefits from education and higher levels of human capital are both monetary and non-monetary in nature. At the individual and household level they correlate to higher future earnings, greater employability and better health, while at the aggregate level they support higher productivity, the reduction of poverty, increased social mobility, a higher level of civic engagement, greater social cohesion, a reduction in the gender gap and women's

empowerment (World Bank, 2018). In particular, primary education continues to exhibit the highest social profitability when compared to higher educational levels across different world regions (Psacharopoulos, 1985; Psacharopoulos & Patrinos, 2018). Thus, the promotion of programs that aim to increase human capital in developing countries is crucial to ignite self-reinforcing patterns of development.

Despite progress, there are significant cross-country differences in the quality of schooling (Kaarsen, 2014) and, as highlighted in recent empirical studies (Hanushek & Woessmann, 2012, 2015; Laurini & Carvalho Andrade, 2012), improved educational outcomes cannot be measured in mere terms of school enrolment and attendance, since higher enrolment and even higher completion rates are not always sufficient signals of improved educational achievements. The failure to provide an improved level of education has led to what has been defined as widespread *learning crises* in global education (Azevedo *et al.*, 2019; UNESCO, 2013), which particularly affects low-middle income countries (LMICs), where the long-lasting effects are the increase in social inequalities within countries and the loss of development opportunities across countries. For this reason a growing emphasis on educational performances and learning outcomes currently pervades both scientific literature and policy recommendations.

In this perspective, international child support (ICS) programs may provide a valuable and effective tool for promoting human capital accumulation in developing countries, provided they target not only school enrolment and attendance but also better educational attainment. Despite Non-Governmental Organizations and institutional donors seldom disputing the effectiveness of ICS programs, these have attracted very limited attention from scholars and their effectiveness is still under researched.[1]

This paper aims to address this literature gap by providing evidence on the micro-level effects of an ICS program that focuses on the school attendance and learning attainments of pupils. Our analysis delves into this debate by evaluating the effects of an ICS on a sample of 309 children (treated, 121; control, 188) who are enrolled in 10 primary schools in Goma (Democratic Republic of Congo, henceforth DRC) and by focusing on a broad set of educational outcomes—namely, performance scores in four different subjects (plus total score), failure rates and school abandonment rates. Through a longitudinal analysis based on a difference-in-differences (diff-in-diff) approach, we provide evidence that the ICS program exerts positive impacts in terms of educational attainments and reduction in drop-out rates. Our analysis of educational micro-data enriches the evidence on the effectiveness of a targeted development initiative, namely an ICS program, in reducing obstacles to learning in poor countries. We suggest that such interventions may enable ICS children to most productively attend school, by reducing both external constraints and the structural uncertainty faced by their households.

The paper is structured as follows: Section 2 reviews the related literature; Section 3 presents the context of the research; Section 4 describes the sample and the research design;

1 The most quoted paper on ICS, Wydick *et al.* (2013), focuses on long-term achievements such as income and wealth in adulthood and shows that ICS programs obtain their results by supporting children's well-being in a broader, holistic perspective and improving their levels of self-esteem and self-expectations. On this issue see also Lybbert & Wydick (2018).

Section 5 presents the main results; Section 6 discusses limitations and provides robustness checks; and Section 7 draws conclusion from the research.

2. Related literature

The education sector constitutes a social priority in LMICs. Since the 1990s, significant flows of official development assistance have sustained programs aimed at enhancing basic educational outcomes:[2] despite some geographical heterogeneity, the number of out-of-school children fell worldwide by almost half between 2000 and 2015.

In the same period Sub-Saharan Africa (SSA), which historically had lagged behind other regions in this respect, achieved a 20% increase in the net enrolment rate, almost tripling the results achieved during the previous decade (United Nations, 2015). However, despite significant results, full enrolment in primary education remains a target that is yet to be met in many poor countries where children—especially in rural, remote and conflict-prone areas—cannot regularly access schools. In this respect, it should be noted that widespread violence negatively impacts not only on enrolment rate and attendance but also primary education outcomes (Bertoni *et al*., 2018; Verwimp & Van Bavel, 2013). These impacts imply long-lasting detrimental effects on human capital accumulation (Justino *et al*., 2013).

Recently, the debate has moved from school enrolment to the quality of learning (Masino & Niño-Zarazúa, 2016; World Bank, 2018), given overwhelming evidence of the structurally poor quality of educational systems in many developing countries. In fact, even in cases where children complete primary school education, they achieve very low competencies, often not mastering basic skills (Hungi *et al*., 2010; PASEC, 2016). These poor results may be the combined effect of unprepared and unmotivated learners, poorly equipped and under-motivated teachers and inadequate infrastructures (UNESCO, 2014; World Bank, 2018). The striking prevalence of such low levels of educational achievement has caused several scholars to refer to a full-blown *learning crisis* (see, for example, Azevedo *et al*., 2019), documented as a double-faced problem: many countries are still struggling to provide education for all[3], and even when children are in school the learning outcomes may be very poor with a high inter-pupil variance. In Pritchett's words, schooling is not the same as learning (Pritchett, 2013) as millions of children lack basic literacy and numeracy skills, despite good rates of schooling.

Poverty exacerbates the magnitude of the problem by imposing obstacles to enrolment (for instance through school fees and other indirect costs) and worsening performance: in fact, malnutrition, illness and harsh environments undermine early childhood learning,[4] widening

2 It is worth mentioning the renewed international commitment brought about by the World Declaration on 'Education for All', adopted by the United Nations Educational Scientific and Cultural Organization (UNESCO) in 1990, and the Millenium Development Goals (MDGs) framework of action that foresaw the achievement of universal primary education as a target to be met by 2015.

3 According to UNESCO, 61 million children of primary school age were still not in school in 2016, the majority living in fragile and conflict-affected countries (UNESCO, 2016).

4 For example, breastfeeding and micro-nutrient supplements are associated with better health and greater cognitive ability, leading to better educational outcomes in developing countries. Deworming, iodine supplements and immunizations have also led to major improvements in children's ability to learn (World Bank, 2018).

gaps in learning outcomes (McCoy *et al.*, 2016; World Bank, 2018). Thus, the combined effect of social dimensions of exclusion (such as poverty) and inadequate school environment might even increase original inequalities and marginalization. In short, an increasing body of evidence shows that it is the quality of education that matters for economic development (Masino & Niño-Zarazúa, 2016).

While early interventions focused on overcoming supply-side constraints (for instance, by building new schools), more recent ones stress the importance of interventions on the demand-side (Lincove, 2015), with specific reference to cash transfers (Abdoulayi *et al.*, 2016; Fiszbein & Schady, 2009); school inputs, such as the provision of uniforms and textbook (Evans *et al.*, 2009; Giordono & Pugatch, 2017); school-based health interventions, such as free or subsidized meals (Diagne *et al.*, 2014; Nikiema, 2019); and deworming (Miguel & Kremer, 2004) or other free sanitary treatments (Glewwe *et al.*, 2016). The existing empirical literature, based on programs implemented in diverse geographic and cultural settings, shows overwhelming evidence suggesting that all programs have a positive impact in terms of higher school enrolment and attendance and lower repetition of grades and drop-out rates.

In terms of learning outcomes, the empirical evidence highlights quite a nuanced reality: despite targeted interventions having an overall positive impact on school attainment, results vary depending on geographical context and on moderating factors included in the analysis. Table 1 summarizes the main results of recent meta-analyses on the effects of targeted interventions on learning outcomes.[5]

Exploring four different categories of treatment applied in primary schools in LMICs, McEwan (2015) shows that instructional interventions—namely teacher training, computers and technology, treatments that modify the size and composition of learning groups and performance incentives—stand out as meaningful areas of action to improve school performance. Furthermore, the meta-analysis by Conn (2017) explores the impact of different types of interventions on school performance in SSA. Results highlight that initiatives aimed at reducing the financial burden—such as cash transfers, the removal of school fees and the provision of uniforms or school meals—have heterogeneous, positive but minor effects on performance. Health treatments (especially against malaria) show a positive effect on cognitive outcomes. Interestingly, using incentives to increase students' motivation produces a larger effect on learning outcomes than incentivizing teachers. More recently, Kim *et al.* (2020) provides further evidence of the positive impact of systematic literacy interventions on children's reading and language outcomes in LMICs. However, these interventions produce differentiated outcomes, showing larger impacts on emergent literacy skills (0.40 SD) and word reading (0.32 SD) across the whole sample. These studies show that a panoply of interventions can improve school performance and reduce the learning crisis, suggesting that other types of interventions targeting school enrolment and learning outcomes are worth exploring.

ICS programs stand out as one interesting example whose widespread application sharply contrasts with the lack of studies on their effectiveness. Indeed, 'given the number of individuals involved in child sponsorship relationships and the billions of dollars committed to them, it is surprising that almost no research exists that evaluates the impacts of these programs' (Wydick *et al.*, 2013, p. 397). Although a reliable figure on the number of

5 Table A1 in Appendix A summarizes the main studies addressing school drop-out as the main outcome.

Table 1: Summary of Main Studies on Development Interventions Aimed at Improving School Performance

Study	Intervention type	Main outcomes	Sample	Main results
McEwan (2015)	Meta-analysis of experiments. School-based interventions (effects on learning): instructional, health/nutrition and incentives programs	Performance	77 randomized experiments, corresponding to 111 treatments. Sample: LMICs including SSA.	Test scores: instructional interventions only: 0.15 SD computer/technology, 0.12 SD teacher training, 0.12 SD smaller classes, 0.08 SD instructional material
Conn (2017)	Meta-analysis of experiments and quasi-experiments. Pedagogical interventions + other complementary interventions (health treatment, provision of school supplies, use of teacher incentives and school based management programs)	Performance	56 impact evaluations, containing 66 separate experiments and quasi-experiments, corresponding to 88 treatments. Sample: SSA.	Test scores: pedagogical interventions only: 0.918 SD full sample (SSA), 0.536 SD without outliers (no moderating factors). Across all interventions, overall average effect size 0.181 SD
Kim *et al.* (2020)	Meta-analysis of Randomized Control Trials a/o quasi-experiments. Multicomponent literacy interventions (effects on language/reading)	Performance	67 studies, corresponding to 129 independent samples and 661 effects size. Sample LMICs including SSA.	Test scores: Overall average effect: 0.30 SD (no moderating factors). Only studies based on SSA: average effect 0.27 SD

internationally sponsored children is not available, it can be reasonably affirmed that the number of assisted children is especially noteworthy.[6] ICS programs are not uniform and show a wide range of different characteristics, mainly due to differences in the identity, the context of the action and the involvement of the promoting organization at the local level. Nevertheless, the core intervention logic is shared by almost every organization (Watson & Clarke, 2014), with improving educational attainment and grade completion standing out as the recognized major objective (Van Eekelen, 2013). Generally speaking, these programs work by alleviating material constraints, such as guaranteeing school access to poor children by covering fees that would not otherwise be affordable and providing uniforms and textbooks. From an operational point of view, ICS initiatives work in a similar way to poverty-targeted cash transfers in resource poor settings; however, they may also contribute to fostering aspirational hopes and agency, by reducing uncertainty and sustaining children's emotional development.

To the best of our knowledge, only a few studies have explored the impact of these initiatives (Kremer *et al.*, 2003; Ross *et al.*, 2019; Wydick *et al.*, 2013, 2017), making ICS programs a broadly neglected instrument and an under-researched topic in the educational outcomes literature. The aforementioned studies provide evidence of the positive effects of child sponsorships on educational attainment, employment and adult income. In particular, Wydick *et al.* (2013, 2017) and Ross *et al.* (2019), studying the effects of Compassion International's child sponsorship program in different countries, show an increase in the probability of school completion (with larger effects for secondary school), in the probability of white-collar employment and in monthly income in adulthood. Additionally, the authors find initial evidence that these results are in part due to increases in children's aspirations.

However, the impact of ICS on learning outcomes has received little attention. This research work contributes filling the evidence gap by exploring to what extent an ICS initiative implemented in DRC impacts on learning outcomes and the acquisition of basic numeracy and literacy competencies.

3. The intervention background

3.1 Primary education in DRC

Despite considerable efforts spent in fostering cohesive partnerships and increasing public financial commitment to education,[7] the Congolese education system is still plagued by low levels of national coverage and poor quality. National data show that 3.5 million children of primary school age are still not in school, and among those attending school, 44% start

6 Wydick *et al.* (2013) provides one of the rare efforts to rigorously quantify the impact of sponsorship programs. Through information gathered from official websites of organizations promoting international child sponsorships, they estimate that in 2012 there were some 9.14 million internationally sponsored children in the world.

7 According to UNESCO, in 2015, 2.29% of GDP was allocated to the education sector, showing a positive trend since 2010 when only 1.60% of GDP was allocated to this purpose. The current Education Sector Plan (2016–2025) brings new emphasis on expanding access and equity, improving learning quality and management of the education sector.

school after the age of 6 years.[8] In other words, DRC is still a country with one of the largest number of out-of-school children. With regards to primary education completion rates, only 68.9% of children who enter first grade complete sixth grade; this percentage falls to 66.5% when considering only female students.[9]

This problematic scenario is even more dramatic in areas where social unrest, instability and widespread violence prevent children from accessing schools and benefiting from a learning environment. With 12.8 million people in dire need of assistance (corresponding to roughly 16% of the total population), DRC continues to witness one of the most complex and long-standing humanitarian crises.[10] Within this context, Kivu represents a region particularly plagued by violence, insecurity, internal displacement, extreme poverty and the breakdown of families, communities and social ties. Many school-age children are unable to access school on a regular basis and therefore they face serious obstacles to acquiring fundamental literacy skills. In 2002 the city of Goma,[11] capital of the North Kivu province, was profoundly affected by the eruption of the Nyiragongo volcano— the effects of which exacerbated the social instability and marginalization of the area. At that time, AVSI Foundation—an Italian non-governmental organization devoted to the promotion of cooperation activities for development[12]—started an emergency initiative in favour of those affected. Complementary to this intervention, an ICS program (called Soutien à Distance, henceforth SAD) was also launched with the aim of increasing school enrolment, reducing drop-outs rates and improving educational outcomes. Gradually, AVSI Foundation broadened its field of intervention from the original focus on education to include child-protection measures.

3.2 AVSI Foundation SAD program

The AVSI Foundation SAD program, as is generally the case with this kind of programs, is based on regular funding by individual private donors in favour of one (or more) especially vulnerable individual child/children, with regular personalized updates (through yearly pictures, updates about the child's school progress and brief written messages) being provided to the donors by the sponsored child. The relationship between the private donor, who allocates a small percentage of his/her monthly income to alleviating child poverty,

8 The education system consists of three levels: (not compulsory) pre-school, for children aged 3–5 years; primary school that constitutes a 6-year cycle, starting at the age of 6; and secondary school, which offers 3 different curricula.

9 Unless otherwise specified, all data reported in this section are gathered from the UNESCO dataset on education. Data retrieved in December 2018 from www.data.uis.unesco.org.

10 Data gathered from the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) website in January 2019.

11 See map in Figure A1.

12 AVSI Foundation, established in 1972, manages several development initiatives that are implemented through stable relationships with local partners and is particularly active in the education sector. In particular, through ICS program, AVSI manages about 22 thousands international child sponsorships in 26 countries (mostly in the Global South). More details at https://avsi.org/en/.

and the child, who lives in a state of need and poverty, creates some degree of personalized involvement.[13]

The specific objective of the SAD program is to improve access to quality education and vocational training. This is achieved through a wide-ranging strategy including the promotion of schooling and apprenticeship courses through conditional subsidies, the reduction of the socio-economic risk families are exposed to,[14] the improvement of the health and nutritional status of children, the strengthening of children's relational ties (with parents or caregivers, teachers and peers) and the development of some sort of child protection mechanisms and social vigilance.

In keeping with the AVSI Foundation's approach, ICS programs are intended to support the personal development of children through a comprehensive approach, involving families and communities. This implies that funds raised from sponsorships are partially devoted to financially supporting children's households (the average amount of resources transferred to a household through the SAD program approximately corresponds to 15% of the yearly household consumption in DRC) through the payment of school fees, the provision of school uniform and the introduction of timely interventions when needed. This support does not include direct cash transfers and it is mostly made *in kind*, through providing a series of specific goods and services to address contingent difficulties.[15] The SAD program not only supports the targeted households' living standards, but also promotes their social inclusion and the empowerment of parents, stepparents and guardians. All interventions listed above are conditional on the sponsored children regularly attending school. Finally, SAD support does not include specific tutoring, mentoring or out of hours school activities specifically designed to foster children's cognitive skills.

The local office of AVSI Foundation, situated in Goma, manages the ongoing interactions with local communities, collecting basic information about the composition of households, health conditions, poverty status and specific needs. The local office is also responsible for selecting children for sponsorship—children are ranked according to a list of objective criteria regarding the household income level, orphanage condition and health conditions—and the provision of specific goods and services (through a number of social workers).

In addition to school support (in the form of payment of fees and provision of uniforms), sponsored children receive health assistance. They are also involved in a range of after-school psycho-social projects, which includes recreational activities, which are open to their peers, and which foster their socio-emotional development, self-esteem and aspirations. In parallel with these activities, families are often invited to take part in sensitization activities that may concern, for example, nutritional or health care issues.

13 This kind of relation specifically characterizes child sponsorship programs, since such personalized involvement works as the core engine of these initiatives (Watson & Clarke, 2014).

14 Frequently, risks arise from negative shocks that may include, among others, illness, loss of employment and structural damages to dwellings.

15 That is, medical examinations and drugs in cases of illness, the establishment of income generating activities in case of job loss and technical repair interventions in cases of damage to the family dwelling.

4. Research design

4.1 Outline and timing

The reference population of this study on educational attainment is composed of vulnerable children living in an environment affected by violence and facing huge health and security challenges. Among this population, a number of children benefit from an ICS program, supporting education. We explore whether these initiatives generate significant results in terms of enrolment, attainment and learning outcomes.

Organizing a longitudinal study in conflict-torn environments, with geographically dispersed interventions could make it very difficult to gather a sample of people under treatment, plus a control group with enough statistical power to perform sound statistical analyses. However, we took advantage of the facilitating circumstance of a new SAD program that AVSI Foundation decided to start during the school year 2015–2016. This involved 10 primary schools, previously unsupported by any international aid program, in the city of Goma (DRC), and targeted about 200 children. In close collaboration with local staff, we implemented our research protocol at the beginning of this new SAD program. According to AVSI Foundation's experience gained in other similar initiatives, 2 years in a SAD program is the minimum time span required to produce (and therefore to observe) significant transformative impacts on children.

More specifically, since the children were assigned to the SAD program in the first months of 2016, the timing considered in the analysis is as follows, as summarized in Figure 1:

- the baseline outcome (pre-treatment) corresponds to the first term of 2015/2016, before the children were assigned to the program;
- the follow-up outcome is measured at the end of the third term of 2016/2017, i.e. after two school years have been completed.[16]

4.2 The sample

The schoolchildren participating in our longitudinal study were identified first of all on the basis of their age. The significant passage of time between the first and the second data collections meant limiting the sample to children who, in principle, could still be attending school 2 years after the initial observation. Therefore, the sample only included children attending from the first1st to the fourth grade in 2015/2016. For each child included in the SAD program (the treatment), we randomly selected two children of the same age and gender who attended the same class (in the same school), to provide a control group. Since the SAD initiative specifically targets the most vulnerable children, the treatment assignment cannot be considered completely random. However, the composition of classes can be reasonably assumed to be random, being performed by school headteachers irrespective of the existence of sponsorship programs sustaining individual children. Thus, we are quite confident that the children included in our sample can be considered a broadly unbiased sample of the entire student's population of the schools and classes we included in the research. Indeed, the schools participating in our research are located in 6 different neighborhoods of Goma (out of a total of 16), which account for more than 40% of the town's population. Furthermore, these neighborhoods encompass a variety of economic conditions: the poorest area in our

16 The school year in DRC consists of three consecutive terms starting in October each year.

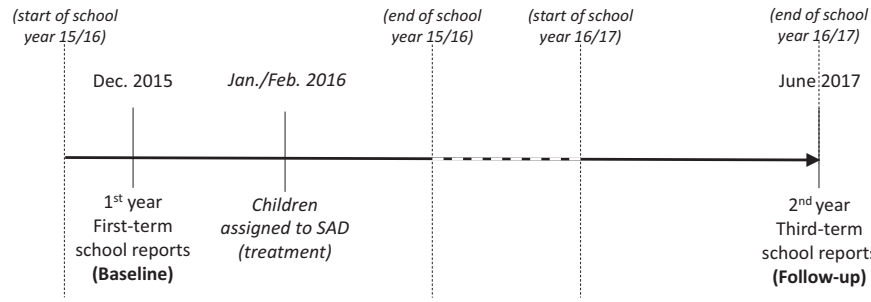

Figure 1: Research Design's Timeline.

sample, as measured by the percentage of people in the poorest quartile by assets endowment, is Ndosho (40%) while the least poor is Virunga (6%). These figures compare to data for the entire municipality, which range from 4% to 43%, as shown by a recent report produced by UNDP, the Harvard Humanitarian Initiative and Monusco (Vinck *et al.*, 2017).

In the first term of the 2015/2016 school year, the resulting sample consisted of 134 children assigned to treatment (in other words, accessing the SAD program) and 264 children forming the control group. In the course of the treatment, five children previously in the control group were included in the SAD program by AVSI Foundation and were therefore excluded from the subsequent analysis. Moreover, before the second data collection, 84 children left school, either because they abandoned it due to being unable to pay school fees or because their families moved away from the area.[17] Therefore, the resulting sample of children included in the final analysis consists of 121 children enrolled in the SAD program and 188 in the control group.[18]

To account for possible differences in the household environments where the children live, we also collected a set of information about background socio-economic characteristics. Table 2 provides a full description of all variables, and Table 3 provides summary statistics by treatment group, as well as the outcome of a *t*-test to assess the pre-treatment balancing of our sample.

Table 3 clearly shows that while the sample results are well balanced for most of our observable variables, the SAD children contain a larger proportion of orphans, single-parent children and children living in precarious dwellings.[19] Although these characteristics refer to a limited number of children in the sample, we address this source of unbalance by controlling for these variables in all our model specifications.

Finally, notes and diaries of social workers revealed a substantially homogeneous treatment in terms of support to schooling (fees and uniforms), while other types of interventions may vary individually according to the emergence of specific (e.g. health related or economic) needs. However, data inspection revealed that, on aggregate, specific interventions are evenly

17 We discuss attrition in more details in Section 6.1.

18 Please note that due to some missing values in school reports, the number of observations reported at the bottom of each model can be less than 309.

19 Looking at those who are orphaned and living in precarious conditions, 9% of SAD children share these characteristics as opposed to only 2% of children in to the control group.

Table 2: Description of Outcome and Control Variables

Variable	Description
School report scores	
Civics and religion	Harmonized score for "civic education and religion"
National languages	Harmonized score for "national (local) languages"
French language	Harmonized score for "French language"
Mathematics	Harmonized score for "mathematics"
Total	Harmonized score for total score, calculated as the sum of all subjects' scores by each term
Individual background characteristics	
Age (years)	Child's age (in years)
Female	Child's sex, binary (female = 1)
Parents:	
- Orphan	Child is orphaned, binary (orphan = 1)
- One parent	One of the child's parents does not live in the household, binary (if absent =1)
- Both parents	Both child's parents live in the household, binary (if both parents are present = 1)
Literate parent	At least one parent is literate, binary (literate = 1)
House type:	
- Hut/precarious	The child lives in a hut or precarious housing
- Adobe	The child lives in an adobe building
- Concrete	The child lives in a concrete house

distributed across treatment groups for the entire period under observation.[20] Therefore, we do not need to control for intra-sample variance of treatment across the treated children: this is confirmed through an analysis of treatment heterogeneity with respect to treatment intensity, as shown in Appendix B.

4.3 School performance scores

For all children in the sample, we collected the school reports for two school years, namely 2015/2016 and 2016/2017. Each report includes information about the scores obtained in each subject for each term of attendance. Furthermore, each school report also includes a total score, computed as the sum of all terms per subject. This total score is what determines the crucial decision at the end of the school year: either promotion to the next class or failure.

The yearly total score is correlated by construction with the baseline observation, since all terms' scores are included in the final sum. Therefore, to handle this issue and to provide robust results, our analysis exploits the information included in the school reports by using the individual scores for each term.

Scores are awarded to students according to different ranges, that are specific to subject, term and grade (see Table C2 in Appendix C), depending on the achievement of a set of standardized learning objectives that are established by the Ministry of Education and applied countrywide. To make comparisons across grades feasible, all raw scores have been firstly

20 We provide a more detailed discussion of this point in Section 6.

Table 3: Summary Statistics of Background Characteristics, by Treatment Group

	SAD		Control		Difference		
	Mean	SD	Mean	SD	Diff.	T-stat	Chi-sq.
Female	0.53	0.50	0.51	0.50	-0.02	(-0.40)	(0.16)
Age (years)	8.01	1.62	7.80	1.50	-0.21	(-1.15)	
Parents:							
- Orphan	0.09	0.29	0.02	0.14	-0.07*	(-2.46)	(7.73)***
- One parent	0.27	0.45	0.14	0.35	-0.13**	(-2.81)	(8.61)***
- Both parents	0.64	0.48	0.84	0.37	0.20***	(3.97)	(16.83)***
Literate parent	0.60	0.49	0.69	0.46	0.09	(1.57)	(2.54)
House type:							
- Hut/precarious	0.08	0.28	0.02	0.13	-0.07*	(-2.49)	(8.12)***
- Adobe	0.87	0.34	0.92	0.27	0.05	(1.43)	(2.24)
- Concrete	0.05	0.22	0.06	0.25	0.01	(0.53)	(2.24)
Observations	121		188			309	

Notes: T-statistics refer to difference between means by group. Pearson Chi-Sq. is reported for binary and categorical variables. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

harmonized, by re-scaling them relative to their subject-, term- and grade-specific maximum. The resulting harmonized scores appear in all subsequent tables and figures.

In order to investigate whether the effect of the SAD varies according to different subject areas, we collected data on four different subjects: civic education and religion ('Civics and religion' henceforth), national (local) languages ('National languages' henceforth), French language and Mathematics, as well as the final total score that summarizes all subjects ('Total' henceforth). We selected these subjects as they are common to all grades and obviously relevant in terms of learning attainment. A detailed outline of learning objectives specific to each subject is provided in Appendix C.

4.4 Estimation technique

We devised an estimation approach to address the specific features of the data and research design. Firstly, we are dealing with observational data, since the treatment has not be fully randomized at the pre-treatment stage of our outcome of interest: we are thus dealing with a quasi-field experiment in which the assignment to treatment is determined by AVSI Foundation. Secondly, the background of the intervention suggests that a high drop-out rate is to be expected. Thirdly, the SAD program targets children's as well as their families' well-being. This implies that the impact of SAD may extend well beyond our sample, although it is very difficult if not impossible to properly assess this wider effect.

Taking in consideration all the above-mentioned features, we built a control group for our analysis by selecting a number of children from the same schools in Goma that hosted SAD children, ensuring that, for each treated child, two children of the same age and gender were randomly chosen from the same class. This ex-ante matching procedure limited the pre-treatment unbalance of our sample with respect to the available observed covariates. Then,

in order to reduce a number of potential biases, we considered that the most appropriate estimation approach is a diff-in-diff analysis, in which the change recorded by the treatment group (SAD children) is compared to the change observed in children belonging to the control group. Diff-in-diff analysis allows the effect of the treatment on the treated sample (i.e. average treatment effect on the treated, henceforth ATT) to be tested by controlling for possible confounding factors, including fixed time-invariant characteristics.

In our analysis, we aimed to estimate the ATT for SAD children based on a set of school performance outcomes. Formally, being $Perf_{jit}$ the score of child i at time t related to subject j (i.e. either Civics and religion, National languages, French language, Mathematics or Total) the effect of the SAD program on each specific j outcome is estimated as follows:

$$Perf_{jit} = \alpha + \beta SAD_{it} + \gamma Post_{it} + \rho(SAD * Post)_{it} + \delta X_i + \epsilon_{it}, \quad (1)$$

where α represents the constant term; *Post* is the time dummy, taking value 1 for observations obtained at the end of the third term in 2016/2017 and 0 for the first term of 2015/2016; *SAD* is the treatment dummy, identifying children enrolled in SAD; X_i are individual children characteristics; ϵ_{it} is the usual error term; and β, γ, ρ and δ are the parameters to be estimated. The ATT effect is estimated by the coefficient ρ.

Diff-in-diff is designed to control for time-invariant fixed effects, which emerge in the estimation process. However, in order to account for possible time-varying confounding factors, we also include some additional controls,[21] namely children's age, a set of dummy variables referring to the presence of both, one or none of their parents and a set of dummy variables referring to the type of house where the children live.[22]

Although in the past decade the female enrolment rate for all ages has been catching up with that of males in many SSA countries, the gender gap in educational attainment is still an issue that implies—among other effects—gender-related labour market inequality. With regards to DRC, school attendance rates highlight a persistent problem for girls to access and attend primary school: thus, we included a binary variable for gender to verify possible discrepancies in the learning attainments achieved by girls.

Finally, our research design envisages the possibility that unobserved peer effects might influence school performances, and for this reason we included a full set of class fixed effects to explicitly account for these.[23] To also control for a possible change in a child's assignment to a class during the time span observed, due for example to optimizing what are most likely to be over-crowed classrooms, we introduced a further binary control taking the value of 1 if the child changed class and 0 otherwise.

To allow a clear interpretation of how SAD treatment influences pupils' scores and changes over time, all coefficients are standardized by 'anchoring' individual scores to the control group's performance values at each term, i.e. the scores of those who attended regular

21 Adding controls in a diff-in-diff allows to (i) address time-varying factors that are likely to give rise to the violation of the common trends assumption and (ii) reduce the error variance of the regression to increase the statistical power of the tests.

22 Please refer to Table 2 for a description of control variables included in the analysis.

23 Class fixed effects refer to the same school year, class and school.

classes without any treatment. The standardization is obtained by treating scores as follows:

$$z_i = \frac{x_i - \overline{x_C}}{\sigma_C}, \tag{2}$$

where z_i is the standardized value of the test score for pupil i, x_i is the raw value of the test score for pupil i, $\overline{x_C}$ is the mean value of the test score in the control group and σ_C is the standard deviation of the test score for the control group. Therefore, all treatment effects in Section 5 are presented in this standardized form. In all model specifications, standard errors are clustered at individual level.

5. Results

5.1 Overview of the children school performance

Drop-out rates, that is leaving school before completion, which is still a major issue in DRC, represents the first dimension of interest in our analysis. Out of the initial 134 SAD children interviewed in the first wave (2015/2016), only 8 dropped out from the sample in the second wave of data collection (about 6%), due to families' moving to other places. Once we looked at the drop-out rate in the control group, we found a strikingly higher value: 76 out of 264 children (about 29%). Even when we rely on a more precise measure of drop-out by excluding 22 children who declared they were moving to another school (and who could therefore potentially complete their primary education there), the drop-out rate remained significantly higher (at about 21%).[24] The difference between drop-out rates in the two sub-samples is statistically significant at the highest level (z-value < 0.001).[25]

A second educational outcome to be explored is pupils' failure rate. Schoolchildren who fail their grade are expected to repeat the same grade the following year.[26] Interestingly, Figure 2 shows that the failure rate of the Control group is substantially constant across the two observed school years, whereas SAD children experience a relevant decrease in their failure rate. While the share of children failing in 2015/2016 was significantly larger for SAD than for the control group (Pearson Chi-sq. = 8.747, p-value = 0.003), this difference is no more statistically significant at the end of 2016/2017 (Pearson Chi-sq. = 0.035, p-value = 0.851).[27]

24 These figures, although large, are quite common in the context of SSA schools. The study by Cho *et al.* (2017) finds a permanent school drop-out of untreated children of about 20% and a temporary drop-out of about 15%; Duflo *et al.* (2015), between 10% and 19% depending on gender; and Iritani *et al.* (2016), an impressive 40.7% in untreated children. A summary of these studies' findings can be found in Table A1 in Appendix A.

25 We are aware that this first outcome also determines an important attrition in the sample when we perform our analysis on the main outcomes, i.e. school performances. We discuss this issue and provide robustness checks in Section 6.

26 In some extreme (and very rare) cases, children who fail their grade in DRC can be also re-assigned to a lower grade.

27 Please note that for 2016/2017 school year this result holds even excluding children repeating their grade due to a previous failure. In this case, the Chi-sq. and p-values are 0.062 and 0.804, respectively, again showing no statistical difference between the two groups after treatment.

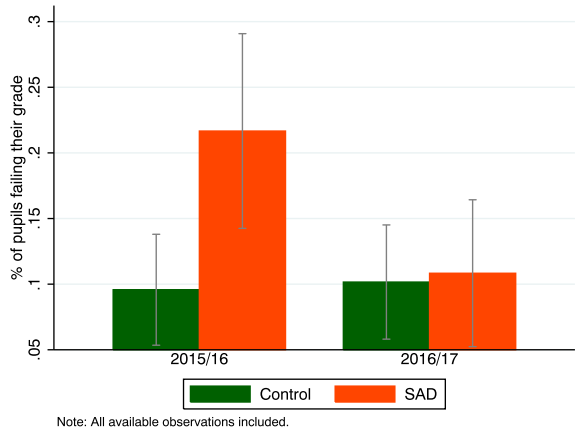

Figure 2: Share of Children Failing at the End of the School Year, by Group

These results are worthy of attention: sponsored children not only experience a lower drop-out rate, but also a significant improvement in terms of their promotion rate (that is, a decrease in failure rate). Although these results, deriving from a specific case study, cannot be easily generalized, they strongly suggest that highly vulnerable children (those selected for SAD sponsorship through a ranking procedure based on poverty and precarious health conditions) can catch up when they are sponsored and when their families are also supported in their specific emerging needs, making it easier for schoolchildren to productively attend school.

One original contribution of this paper is the use of micro data gathered from schools to assess both educational attainment and learning performance in a challenging environment plagued by high poverty rates.

Figure 3 provides a comparison of the scores of SAD and control children over the treatment period, i.e. the first term of 2015/2016 and the third term of 2016/2017.

Again, the figure shows a clear catch-up pattern for SAD children. On average, sponsored children, in fact, perform well far behind children in the control group before the treatment started.

The progression achieved by SAD children is impressive: they improved at a higher rate than children belonging to the control group in all subjects and, moreover, they actually overtook them in two subjects—namely Mathematics and Civics and religion—at the end of the second year. In the other two subjects included in the analysis—namely French language and National languages—although children in the control group perform better, the catching-up progression is still evident.

Such widespread evidence across all grades and subjects suggests the importance of alleviating socio-economic and health-related constrains, as well as reducing uncertainty about the child's future possibility to regularly attend school (Lybbert & Wydick, 2018).

5.2 Analysis of treatment effect

As shown in Section 4.2, SAD and control group are substantially balanced in terms of pre-treatment background features, with two exceptions, namely the likelihood of being an

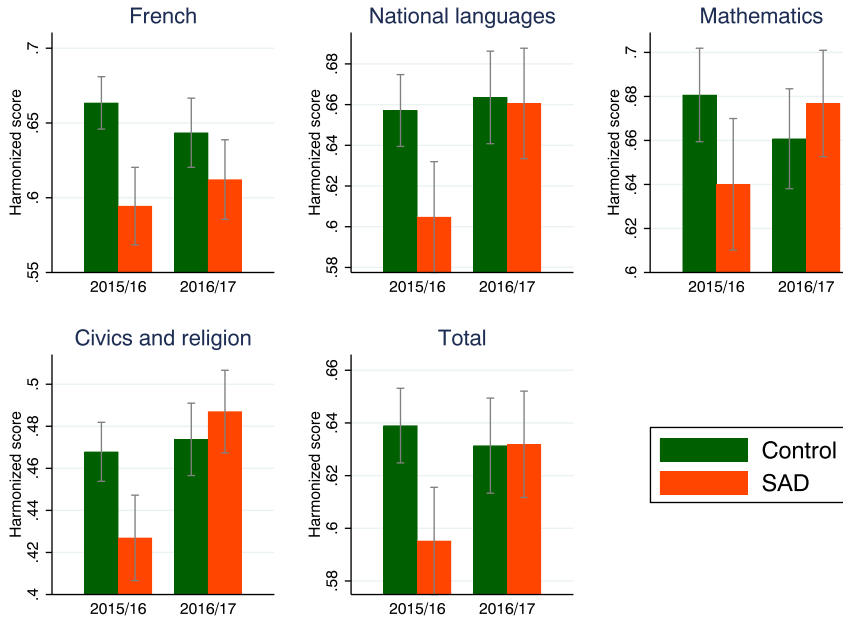

Figure 3: Re-scaled Test Scores, by Group

orphan and the precariousness or inadequacy of their housing. For this reason, we included corresponding controls in the analysis.

In terms of school performance indicators, during the first school term observed, sponsored children achieved statistically significant lower scores than children belonging to the control group. A set of balance tests on performance indicators are summarized in Table 5 and are consistent with mean differences already shown in Table 3.[28]

Balance tests substantiate the descriptive analysis provided in the previous section, by highlighting that SAD children initially lag behind their peers. This feature can be explained by the fact that the selection process for possible sponsorship explicitly targets more vulnerable children, who are likely to face major challenges in terms of educational attainment, due to a more uncertain household environment. It is reasonable to assume that such insecurity may divert children's attention and effort away from the fulfilment of their school activities, with the result that they loose the opportunity to develop their skills' potential.

28 Table 5 also includes information about the number of days of absence. Since, in principle, differences in daily attendance can generate different outcomes in terms of learning attainments, we also collected information about this indicator. We found that differences in variance across groups are null and statistically not significant—possibly due to the procedures used in schools for the roll call—thus the number of days of absence results not informative given the research design adopted, and this measure is not included in the analysis.

Table 4: Summary Statistics of School Performance Scores, by Treatment Group and School Year

Panel A:	School year 2015/2016, first term					
	SAD		Control		Difference	
	Mean	SD	Mean	SD	Diff.	T-stat
Civics and religion	0.43	0.11	0.47	0.10	0.04**	(3.26)
National languages	0.60	0.15	0.66	0.12	0.05**	(3.17)
French	0.59	0.14	0.66	0.12	0.07***	(4.33)
Mathematics	0.64	0.17	0.68	0.15	0.04*	(2.17)
Total	0.60	0.11	0.64	0.10	0.04***	(3.47)
Observations	120		184		304	
Panel B:	School year 2016/2017, third term					
	SAD		Control		Difference	
	Mean	SD	Mean	SD	Diff.	T-stat
Civics and religion	0.49	0.11	0.47	0.12	-0.01	(-0.99)
National languages	0.66	0.15	0.66	0.16	0.00	(0.16)
French	0.61	0.15	0.64	0.16	0.03	(1.75)
Mathematics	0.68	0.13	0.66	0.16	-0.02	(-0.95)
Total	0.63	0.11	0.63	0.13	-0.00	(-0.04)
Observations	120		187		307	

Notes: Harmonized and standardized test scores. T-statistics refer to difference between means by group. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

As shown by the results of the diff-in-diff analysis (Table 6), SAD children experience a positive and significant improvement in every subject, including the total score. The strongest effect is found in relation to French language and Civics and religion.[29]

While recognizing that full comparison is not possible, since no other study has specifically assessed an ICS program, the size of these results is relatively large in comparison to existing empirical evidence, as summarized in Table 1. Our estimated ATT ranges from a minimum of 0.29 SD for Mathematics to a maximum 0.62 SD for Civics and religion. The effect on the total score, ranging between 0.47 and 0.49 SD, is large if compared to the findings of Kim *et al.* (2020, 0.27 SD on average in SSA) and comparable with the main effect found in Conn (2017, 0.536 SD excluding outliers), while it is lower than the average effect found in the same study for pedagogical interventions. This finding is consistent with the fact that the SAD program does not directly target cognitive skills (as, for example, through some sort of tutoring program), but rather provides, besides fees and uniform, health-related and economic support when needed to children's households thus reducing uncertainty about possible negative and potentially disrupting health and economic negative shocks.

29 As a robustness check, we performed a diff-in-diff analysis considering an alternative follow-up measure, namely the sum of test scores achieved in the second and third terms of 2016/2017. In this way, any potential term-specific effect is averaged between the two scores. Moreover, this measure helps incorporate part of the trend of the children's performance in 2016/2017. The corresponding results confirm the outcome shown in Table 6.

Table 5: Balance Tests, Performance Indicators, Pre-treatment

	School performances					Attendance		Pass
	Civics and religion	National languages	French language	Mathematics	Total	Absences	Presences	
SAD	-0.436***	-0.428***	-0.581***	-0.289**	-0.469***	0.364	-0.005	-1.003**
	(0.146)	(0.136)	(0.157)	(0.122)	(0.140)	(0.230)	(0.004)	(0.430)
Constant	-0.093	0.041	-2.015***	-1.224***	-2.073***	-16.662***	5.404***	2.155***
	(0.146)	(0.136)	(0.157)	(0.122)	(0.140)	(1.014)	(0.001)	(0.189)
Class Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	304	304	303	301	300	309	309	217
Log Likelihood	-387	-419	-415	-380	-400	-874	-1143	-95
AIC	777	840	833	763	803	1791	2288	197
BIC	780	844	837	766	806	1869	2291	211

Notes: [1] Dep. vars.: harmonized and standardized test scores. Balance tests performed through OLS. [2] Dep. vars.: binary variable equal to 1 if the child is admitted to the following grade. Balance test performed through a Logit model. Performance scores refer to pre-treatment levels (first term of 2015/2016); pass refers to the end of 2015/2016. Standard errors in parentheses, clustered at class level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 6: Treatment effect on School performance, Diff-in-Diff, paired samples

	Civics and Religion		National languages		French language		Mathematics		Total	
ATT	0.615***	0.606***	0.387**	0.365**	0.550***	0.539***	0.329**	0.291**	0.494***	0.470***
	(0.146)	(0.144)	(0.161)	(0.157)	(0.158)	(0.157)	(0.152)	(0.146)	(0.148)	(0.144)
Controls†	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Class FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-sq.	0.22	0.22	0.09	0.09	0.16	0.17	0.18	0.19	0.15	0.16
Observations	611	611	611	611	610	610	608	608	607	607
AIC	1691	1696	1813	1816	1753	1748	1677	1676	1730	1727
BIC	2164	2204	2290	2324	2230	2255	2145	2183	2206	2234

Notes: Baseline: First term 2015/16; Follow-up: Final term 2016/2017. Standard errors in parentheses, clustered at individual level. [†] Included control variables: Age, Female, Parents number, Literate Parent and House type. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Overall, these results show the SAD program producing a strong positive and significant effect on the performance scores achieved by sponsored children. While SAD children start with a clear disadvantage, the program closes the gap: this process of convergence corroborates the idea that being supported (in both material and non-material terms) makes a difference in school performance. Larger impacts are found in subjects where SAD children appear to achieve very poor school performances before the start of the treatment. It is interesting to note that in Mathematics, which is a standard subject used to identify learning attainments, SAD children end up performing even better than their peers in absolute terms. A possible explanation relates to the fact that at the beginning of the intervention, children in the control group are exposed to the same sort of insecurity and uncertainty as their treated peers, although possibly to a lower extent as suggested by their overall 'better' household conditions and circumstances. Once the program starts, SAD children enjoy a sort of 'insurance' that reduces their structural uncertainty, in contrast to the control children, who still face the same insecurity they faced at the beginning.

Finally, we do not find any gender-based evidence on the different school performance indicators. This result is fully compatible with the principle of SAD that being focused on each child's family and close relationships tends to be therefore 'gender blind'.

6. Robustness checks

6.1 Attrition

As stated in Section 5, one of the main outcomes of the paper is a much larger drop-out rate observed in the control group compared to the treatment group. However, this outcome clearly affects the composition of the sample in the second wave of data collection. Since a non-random attrition implies that the composition of the control group changes over time, we need to exclude that the control group is not worsening in terms of mean scores. Firstly, we address this issue by providing a balance test of baseline background characteristics and performance scores to assess potential attrition bias in the control group.

Table 7 reports the comparisons of means for control and outcome variables between children in the control group who drop-out (control: drop) and those who do not not drop-out (control: no drop).

Table 7 shows that the only marginal difference between the two sub-samples of the control group relates to their orphaned status: orphaned children are more likely to drop-out of school, in the absence any other form of support. In terms of performance scores, the bottom part of the table shows that children who do not not-drop out of school in the control group record significantly better scores at the baseline for National languages, French language and total, while Civics and religion and Mathematics scores, although higher, are not significantly different from those of children in the control group who drop-out during the 2015/2016 school year. These results suggest that if attrition is biasing the composition of the control group, by 'improving' it in terms of score mean values, we can therefore conclude that the estimated ATT reported in Section 5 is likely to be a lower-bound estimate.

Since the analysis summarized in the top panel of Table 7 is not conclusive about attrition being non-random, we decided to expand our research to include possible unobservable factors affecting the probability of drop-out in the first school year. We thus implemented a Heckman two-step correction (Heckman, 1979) to correct potential bias due to non-random attrition. As is well known, this procedure allows to model sample selection by modelling

Table 7: Summary statistics of background characteristics of drop-out students

	Control: Drop		Control: No Drop		Difference		
	Mean	SD	Mean	SD	Diff.	T-stat	Chi-sq.
Background characteristics							
Female	0.50	0.50	0.51	0.50	0.01	(0.08)	(0.01)
Age (Years)	8.04	1.74	7.80	1.50	-0.24	(-1.06)	
Parents:							
- Orphan	0.00	0.00	0.02	0.14	0.02*	(2.02)	(1.64)
- One parent absent	0.11	0.31	0.14	0.35	0.03	(0.76)	(0.53)
- Both parents	0.89	0.31	0.84	0.37	-0.05	(-1.22)	(1.30)
Literate parent	0.68	0.47	0.69	0.46	0.01	(0.11)	(0.01)
House type:							
- Hut/Precarious	0.08	0.27	0.02	0.13	-0.06	(-1.94)	(6.52)**
- Adobe	0.04	0.20	0.06	0.25	0.02	(0.85)	(0.98)
- Concrete	0.88	0.33	0.92	0.27	0.04	(0.91)	(0.60)
Pre-treatment performance indicators							
Civics and religion	0.45	0.09	0.47	0.10	0.01	(1.11)	
National languages	0.59	0.14	0.66	0.12	0.06**	(3.25)	
French language	0.60	0.13	0.66	0.12	0.06***	(3.54)	
Mathematics	0.65	0.14	0.68	0.15	0.03	(1.45)	
Total	0.60	0.10	0.64	0.10	0.04**	(2.89)	
Observations	76		188		264		

Notes: T statistics refer to difference between means by group. Pearson Chi-Sq. is reported for binary and categorical variables. $^{*}p < 0.10, ^{**}p < 0.05, ^{***}p < 0.01$

the individual sampling probability through a 'selection equation'. Since our research staff in the field recorded that about 90% of drop-outs were motivated by economic factors,[30] we model selection including two control variables: a categorical variable to identify the parent's/guardian's occupation[31] and a binary variable identifying children living further than 1 km from the school. All other control variables are included in both the selection and the outcome equations.

Table 8, reports the results of the estimated Heckman models and shows that the magnitude and significance of the ATT is consistent with the main results shown in Table 6. Therefore, we can exclude the internal validity of our results being affected by severe attrition bias.

Since the Heckman approach may be vulnerable to misspecification (e.g. Puhani, 2000) and assumes that attrition is conditional on observables only,[32] as a further robustness check

30 That is, either the family of the child could not afford to pay school fees (52%) and/or school-related expenses, or the family adult components moved away from Goma to either return to their original village (where the cost of living is lower) or to find a job elsewhere in the country (39%).

31 We only recorded the occupation of the parent/guardian generating the 'main' source of income in the household, through a categorical variable. Categories: workman, petty trader, artisan, farmer, unemployed (reference category).

32 We thank an anonymous referee for this suggestion.

Table 8: Treatment effect on School performance, Diff-in-Diff, Heckman Two-step correction

	Civics and religion	National languages	French language	Mathematics	Total
ATT	0.655***	0.448**	0.566***	0.308*	0.512***
	(0.171)	(0.197)	(0.172)	(0.160)	(0.172)
Controls†	Yes	Yes	Yes	Yes	Yes
Class FE	Yes	Yes	Yes	Yes	Yes
Total Obs	768	768	767	765	764
Selected	609	609	608	606	605
Non Selected	159	159	159	159	159

Notes: Baseline: First term 2015/16; Follow-up: Final term 2016/2017. Standard errors in parentheses, clustered at individual level. [†] Included control variables: Age, Female, Parents number, Literate Parent and House type. The selection model includes a categorical variable for Parent's occupation and a dummy for Distance to school larger than 1 km. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table 9: Treatment upper and lower bounds

	ATT estimates		Treatment bounds†			
	Main ATT	Heckman	Lower bound	p-value	Upper bound	p-value
Civics and religion	0.615	0.655	-0.080	0.608	1.020	0.000
National languages	0.387	0.448	-0.218	0.180	0.917	0.000
French language	0.550	0.566	-0.238	0.145	0.862	0.000
Mathematics	0.329	0.308	-0.191	0.210	0.830	0.000
Total	0.494	0.512	-0.139	0.330	0.888	0.000

Notes: [†] Lee bounds calculated following Lee (2009) using the Stata package by Tauchmann (2014). Main ATT estimates as reported in Table 6; Heckman Two-Step estimates as reported in Table 8.

we also provided the treatment's lower and upper bounds for all outcomes, adopting Lee's procedure (Lee, 2009).[33] This further analysis, reported in Table 9, shows that, while the upper bounds are fairly large and strongly significant, the lower bounds are never significantly different from 0. In the extreme case that attriters satisfy Lee's monotonicity assumption (i.e. that the outcomes of attriters in the control group are as high as the best non-attriter treated) we cannot exclude the ATT of the program being nil. However, as Tauchmann (2014) points out it, the assumptions of Lee bounds are somewhat extreme. As Table 7 shows, the pre-treatment performance of control attriters were either the same or slightly worse than their non-attriter peers. Furthermore, all the other observed background characteristics were similar to those of the non-attriters. Finally, while treatment is likely to affect attrition in our sample (since attrition, i.e. school drop-out, is an outcome of our analysis), we ascertained that the decision dropping out of school was mostly motivated by economic reasons (the parents' inability to pay school fees or to make a living in the peri-urban area). Thus, it is unlikely that dropping out is related to school performance.

33 This procedure deals with non-random sample selection by resting on two assumptions: random assignment to treatment and monotonicity about selection mechanism. Lee's procedure 'trims' the sample by ensuring that the share of observations for which outcome is available is the same in both treatment and control group.

6.2 Matching

To further address the concern about the high attrition level we observe in the control group and to provide an additional robustness check on our results, we replicated the diff-in-diff analysis on a sub-sample of matched children, controlling for *ex-ante* possible unobserved confounding effects.

Matching is in fact an algorithm to pre-process data in order to eliminate or at least reduce the potential selection bias, by coupling each treated observation to its most similar control. Matching can be performed through a variety of alternative methods. In order to minimize model-dependence and ex-post unbalance, we pre-processed data through the coarsened exact matching (CEM) procedure described in Blackwell *et al.* (2009). This procedure carries a number of benefits with respect to alternative popular methods, such as propensity score matching (King & Nielsen, 2019), in particular by bounding both the ex-post unbalance and the error in estimating the ATT (Iacus *et al.*, 2012).

Table 10 shows the results of the diff-in-diff estimation after the CEM matching procedure applied to school, class, age and sex. We selected these observable features since they reflect the underlying structure of our research design.[34] Control variables referring to the number of parents and housing conditions are still included in the model. We obtained consistent results that corroborate the soundness of our analysis.[35]

7. Discussion and conclusions

Despite improvements in terms of school enrolment and educational attainment achieved by low-income countries in recent decades, their educational systems are still plagued by a number of problems which result in inadequate learning for a significant share of the population.

Many recent development initiatives specifically target educational attainment, but the empirical evidence about their impact is still limited. ICS programs, although connected to the achievement of better educational outcomes, remains an under-studied category of intervention.

This paper presents a novel evidence in this field by using original micro data to explore the effect of an ICS program on educational attainment.

34 The small variance in the remaining control variables makes them unsuited for matching, since they would lead to an excessive loss of observations. In particular, SAD children show characteristics suggesting a higher degree of vulnerability in comparison to the control group's children, due to the selection criteria applied. This operational choice was beyond the control of the research team. However, it should be noted that the potential bias occurring due to this selection process is likely to produce a downward bias on the ATT, since highly vulnerable children are expected to face major obstacles to learning attainment. This reasonable expectation is confirmed by the balance test carried out on the baseline values of outcome variables.

35 The fact that significance levels of the ATT are lower for some subjects is mainly due to a reduction in the sample size. As a further robustness test, we restricted the sample to children with fully recorded school reports only (i.e. case-deleting all observations with missing data in at least one subject). The outcome of the analysis is substantially unchanged and coefficients as well as significance levels appear stable and robust. Results are available upon request.

Table 10: Treatment effect on School performance, Diff-in-Diff, matched samples

PANEL A: No residual control variables

	Civics and religion	National languages	French language	Mathematics	Total
ATT	0.484***	0.371**	0.385**	0.288*	0.438***
	(0.162)	(0.183)	(0.173)	(0.155)	(0.157)
Controls	No	No	No	No	No
Adj. R-sq.	0.03	0.03	0.05	0.01	0.03
Obs	522	522	520	516	512
Matched: Treated	104	104	104	155	153
Matched: Control	157	157	156	103	103
AIC	1480	1496	1480	1443	1439
BIC	1497	1513	1497	1460	1456

PANEL B: Including control variables

	Civics and religion	National languages	French language	Mathematics	Total
ATT	0.513***	0.380**	0.397**	0.290*	0.457***
	(0.165)	(0.185)	(0.177)	(0.157)	(0.159)
Controls	Yes	Yes	Yes	Yes	Yes
Adj. R-sq.	0.03	0.02	0.05	0.00	0.04
Obs	522	522	520	516	512
Matched: Treated	104	104	104	155	153
Matched: Control	157	157	156	103	103
AIC	1484	1501	1481	1452	1441
BIC	1522	1540	1519	1491	1479

Notes: Baseline: First term 2015/16; Follow-up: Final term 2016/2017. Standard errors clustered at individual level. Matched samples (CEM), based on school, class, age and sex. All available subject-specific observations included in the sample; 106 Treated and 161 Controls. Actual matched observations vary across models due to data availability. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

The analysis is based on the outcomes of a quasi-field experiment carried out in ten primary schools located in the peri-urban districts of Goma (Kivu region, DRC), in close cooperation with AVSI Foundation—the organization promoting the ICS program under scrutiny, named Soutien à Distance. SAD aims to support schoolchildren to attend school, also by supporting their families in the event of emerging health-related or economic distress, thus reducing the level of structural socio-economic uncertainty.

We observed the school performances of children selected to be enrolled in the program (the treatment group) and school performances of untreated children (the control group) randomly chosen from the same school, grade and class, matching age and gender, over a period of two school years.

Through a diff-in-diff analysis we compared the initial performance scores (observed at the first term of 2015/2016, i.e. before SAD started) with the after-treatment scores (observed at the third term of 2016/17) for both the treated and the controls. We tested whether the SAD program in Goma impacts on school performances in a broad range of subjects—namely Civic education and religion, French language, National languages and Mathematics—by

analyzing variations in test scores that were gathered from school reports. The results notably show that sponsored children, while lagging behind before the program started, catch-up with the control children in all subjects. Moreover, sponsored children also report lower drop-out rates and failure rates than their peers. As a robustness check, we verified the consistency of these results by implementing a sound matching technique (CEM) that exploits the structure of the data to produce unbiased estimates and perfect ex-post balancing.

Our findings are compatible with the argument that ICS programs contribute to alleviating external constraints, such as schooling costs and socio-economic uncertainty, as well as internal constraints that may arise when children currently attend school, but fear they may not be able to attend in the future. We are, however, unable to disentangle these two effects with the available empirical evidence.

We are aware of the potential limitations of our analysis arising from the impossibility of a full randomization process and the limited external validity of our results; however, we believe this research provides a valuable contribution to the still-scarce literature concerning the measurements of the impacts of child support programs on educational attainment.

In conclusion, our results suggest that highly vulnerable children can actually catch up, when direct support (towards the payment of fees and the costs of school uniforms) is complemented by broader forms of family support. This may provide some valuable policy implications since AVSI Foundation implements SAD programs in 26 countries around the world, in very different socio-economic contexts, at different school levels and at very different scales of intervention.

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Supplementary material

Supplementary material is available at *Journal of African Economies* online.

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Appendix A: Supplementary figures and tables

Figure A1: Location of the schools included in our sample, Goma, DRC.

Table A1: Summary of the main studies on development interventions aiming at contrasting school drop-out

Study	Intervention type	Main Outcomes	Sample	Main Results
Glewwe *et al.* (2010)	RCT in Kenya (randomization by school). Teachers incentives (monetary) based on students' test scores	Drop-out; Performance	54,346 students in 100 primary schools (enrolled in grade 4-8 at the beginning) (50 treated+50 control)	Drop-out: unchanged; Test scores: +0.136 sd (on exams linked to the incentives, but not on other, unrelated exams)
Duflo *et al.* (2015)	RCT in Kenya (randomization by school) Education subsidies (free school uniforms) + other (HIV)	Drop-out [other: early pregnancy; STI]	19,289 students in 328 primary schools (enrolled in grade 6 at the beginning of the study)	Drop-out rate: from 19% to 16% for girls; from 13% to 10% for boys after 3 years
Iritani *et al.* (2016)	Diff-in-Diff in Zimbabwe Education subsidies: school fees, uniform, school supplies	Drop-out; Performance	328 Students (orphan girls) in 25 primary school (enrolled in grade 6 at the beginning of the study)	Drop-out: OR 0.40 (21.9% among treated vs 40.7% among controls); Test scores: unchanged
Cho *et al.* (2017)	Cluster RCT in Kenya (randomization by school). Coverage of school expenses (exam fee, tuition fees, uniforms)	School drop-out; Educational outcomes	937 orphan children in 26 primary schools	Drop-out: OR 0.41

Table A2: Treatment effect on School performance, Diff-in-Diff as in Table 6, all coefficients

	Civics and religion		National languages		French language		Mathematics		Total	
ATT	0.615***	0.606***	0.387**	0.365**	0.550***	0.539***	0.329**	0.291**	0.494***	0.470***
	(0.146)	(0.144)	(0.161)	(0.157)	(0.158)	(0.157)	(0.152)	(0.146)	(0.148)	(0.144)
Time dummy	0.561**	0.701	-0.575**	-0.542	0.000	0.120	-0.958	-0.850	-0.443**	-0.285
	(0.276)	(0.439)	(0.268)	(0.393)	(0.249)	(0.272)	(0.773)	(0.724)	(0.205)	(0.249)
Treatment dummy	-0.436***	-0.421***	-0.428***	-0.432***	-0.581***	-0.576***	-0.289**	-0.297**	-0.469***	-0.464***
	(0.127)	(0.131)	(0.138)	(0.144)	(0.143)	(0.145)	(0.130)	(0.133)	(0.138)	(0.141)
Age (Years)		0.040		0.047		0.096		0.108**		0.084
		(0.053)		(0.054)		(0.065)		(0.052)		(0.058)
Female		0.138		0.187		0.092		0.227*		0.195
		(0.123)		(0.134)		(0.126)		(0.122)		(0.126)
House type:										
- Adobe		0.495**		0.386**		0.557***		0.425**		0.570***
		(0.206)		(0.190)		(0.166)		(0.197)		(0.175)
- Concrete		0.592**		0.384		0.929***		0.358		0.620**
		(0.285)		(0.278)		(0.256)		(0.292)		(0.282)
Parents number:										
- One parent		0.134		0.260		0.140		0.207		0.192
		(0.222)		(0.260)		(0.245)		(0.234)		(0.242)
- Both parents		0.022		0.061		-0.001		0.048		0.034
		(0.212)		(0.246)		(0.229)		(0.219)		(0.228)
Literate parent		0.042		0.066		0.027		-0.089		-0.021
		(0.119)		(0.140)		(0.122)		(0.122)		(0.123)

(Continued.)

Table A2: Continued.

	Civics and religion		National languages		French language		Mathematics		Total	
Constant	-0.154	-1.100	0.312	-0.638	0.388	-1.189	0.994***	-0.630	0.814	-0.686
	(0.428)	(0.798)	(0.711)	(0.993)	(0.731)	(1.082)	(0.229)	(0.639)	(0.665)	(0.979)
Class FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-sq.	0.22	0.22	0.09	0.09	0.16	0.17	0.18	0.19	0.15	0.16
Obs	611	611	611	611	610	610	608	608	607	607
AIC	1691	1696	1813	1816	1753	1748	1677	1676	1730	1727
BIC	2164	2204	2290	2324	2230	2255	2145	2183	2206	2234

Baseline: First term 2015/16; Follow-up: Final term 2016/2017. Standard errors clustered at individual level. Reference category for Parents number: Orphan; reference category for House Type: Hut/Precarious.
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table A3: Treatment effect on School performance, Heckman correction as in Table 8, all coefficients

	Civics and religion	National Languages	French language	Mathematics	Total
Outcome model					
ATT	0.655***	0.448**	0.566***	0.308*	0.512***
	(0.171)	(0.197)	(0.172)	(0.160)	(0.172)
Treatment dummy	-0.207	-0.110	-0.462*	-0.234	-0.296
	(0.262)	(0.299)	(0.268)	(0.253)	(0.272)
Time dummy	0.754	-0.465	0.147	-0.831	-0.242
	(0.757)	(0.844)	(0.785)	(0.742)	(0.780)
Age (Years)	0.050	0.061	0.100**	0.111**	0.090*
	(0.045)	(0.050)	(0.046)	(0.044)	(0.046)
Female	0.153	0.209	0.099	0.232**	0.207*
	(0.116)	(0.133)	(0.117)	(0.110)	(0.118)
House type:					
- Adobe	0.625**	0.581**	0.625**	0.464**	0.670***
	(0.245)	(0.283)	(0.246)	(0.229)	(0.248)
- Concrete	0.837**	0.753*	1.058***	0.431	0.806**
	(0.380)	(0.437)	(0.382)	(0.357)	(0.383)
Parents number:					
- One parent	0.190	0.345	0.168	0.229	0.236
	(0.212)	(0.243)	(0.213)	(0.208)	(0.214)
- Both parents	0.048	0.101	0.012	0.063	0.056
	(0.194)	(0.222)	(0.196)	(0.191)	(0.196)
Literate parent	0.045	0.071	0.032	-0.095	-0.019
	(0.120)	(0.138)	(0.122)	(0.114)	(0.122)
Constant	-1.629*	-1.415	-1.460	-0.794	-1.084
	(0.911)	(1.028)	(0.935)	(0.888)	(0.935)
Selection model					
Age (Years)	0.038	0.038	0.037	0.038	0.035
	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)
Female	0.059	0.059	0.060	0.061	0.061
	(0.170)	(0.170)	(0.170)	(0.170)	(0.170)
House Type:					
- Adobe	0.861***	0.861***	0.859***	0.852***	0.855***
	(0.271)	(0.271)	(0.271)	(0.271)	(0.271)
- Concrete	1.430***	1.430***	1.428***	1.425***	1.406***
	(0.395)	(0.395)	(0.395)	(0.395)	(0.397)
Parents number:					
- One parent	0.245	0.245	0.239	0.300	0.241
	(0.351)	(0.351)	(0.351)	(0.356)	(0.351)
- Both parents	0.086	0.086	0.089	0.152	0.088
	(0.331)	(0.331)	(0.331)	(0.337)	(0.331)
Literate parent	0.099	0.099	0.099	0.100	0.100
	(0.188)	(0.188)	(0.188)	(0.188)	(0.188)
Distance	0.005	0.005	0.001	-0.005	-0.008
	(0.116)	(0.116)	(0.116)	(0.116)	(0.116)

(Continued.)

Table A3: Continued

	Civics and religion	National Languages	French	Mathematics	Total
Parent's occupation:					
- Workman	-0.138	-0.138	-0.138	-0.140	-0.140
	(0.322)	(0.322)	(0.322)	(0.322)	(0.322)
- Small business	-0.152	-0.152	-0.151	-0.149	-0.154
	(0.300)	(0.300)	(0.300)	(0.300)	(0.300)
- Artisan	0.041	0.041	0.041	0.042	0.039
	(0.279)	(0.279)	(0.279)	(0.279)	(0.279)
- Farmer	0.560	0.560	0.562	0.577	0.560
	(0.633)	(0.633)	(0.633)	(0.636)	(0.633)
Constant	-0.717	-0.717	-0.708	-0.776	-0.693
	(0.494)	(0.494)	(0.494)	(0.500)	(0.494)
lambda	0.597	0.896	0.315	0.173	0.459
	(0.661)	(0.750)	(0.676)	(0.631)	(0.679)
Class FE	Yes	Yes	Yes	Yes	Yes
Total Obs	768	768	767	765	764
Selected	609	609	608	606	605
Non Selected	159	159	159	159	159

Notes: Baseline: First term 2015/16; Follow-up: Final term 2016/2017. Standard errors clustered at individual level. Reference category for Parents number: Orphan; reference category for House Type: Hut/Precarious; reference category for Parent's occupation: Unemployed. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table A4: Treatment effect on School performance, matched samples as in Table 10, Panel B

	Civics and religion	National Languages	French language	Mathematics	Total
ATT	0.513***	0.380**	0.397**	0.290*	0.457***
	(0.165)	(0.185)	(0.177)	(0.157)	(0.159)
Time dummy	-0.056	0.035	0.040	0.020	-0.045
	(0.133)	(0.165)	(0.171)	(0.139)	(0.147)
Treatment dummy	-0.420***	-0.419***	-0.566***	-0.277*	-0.480***
	(0.145)	(0.152)	(0.147)	(0.143)	(0.141)
House Type:					
- Adobe	0.225	0.388**	0.370***	0.137	0.355**
	(0.213)	(0.155)	(0.137)	(0.223)	(0.167)
- Concrete	0.496*	0.607***	0.828***	0.173	0.706**
	(0.270)	(0.225)	(0.256)	(0.301)	(0.286)
Parents number					
- One parent	-0.052	0.028	0.094	0.066	0.048
	(0.187)	(0.218)	(0.218)	(0.221)	(0.222)
- Both parents	-0.077	-0.038	0.003	0.012	-0.094
	(0.179)	(0.225)	(0.214)	(0.207)	(0.220)
Literate parent	0.172	0.018	-0.015	0.015	0.075
	(0.124)	(0.129)	(0.137)	(0.128)	(0.133)
Constant	-0.160	-0.391	-0.431	-0.130	-0.293
	(0.278)	(0.280)	(0.264)	(0.285)	(0.275)
Adj. R-sq.	0.03	0.02	0.05	0.00	0.04
Obs	522	522	520	516	512
AIC	1484	1501	1481	1452	1441
BIC	1522	1540	1519	1491	1479

Notes: Baseline: First term 2015/16; Follow-up: Final term 2016/2017. Standard errors clustered at individual level. Matched samples (CEM), based on school, class, age and sex. All available subject-specific observations included in the sample; 106 Treated and 161 Controls. Actual matched observations vary across models due to data availability. Reference category for Parents number: Orphan; reference category for House Type: Hut/Precarious. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Appendix B: Treatment homogeneity

As a final robustness check, we address the concern that SAD intervention may vary due to differential intensity in the treatment. For this reason, relying on notes and diaries regularly kept by AVSI staff for all supported children, we investigated whether the number of single interventions may introduce heterogeneity in the treatment effect, conditional on treatment intensity. To assess this occurrence we inspected the residuals of the main Diff-in-Diff model shown in Table 6 and contrasted to the number of single interventions received by each child's household during the research period. As shown in Figure B1, no clear pattern emerges in any of the outcomes of interest, thus allowing to exclude that the effect on performance is driven by the number of single interventions received through SAD.

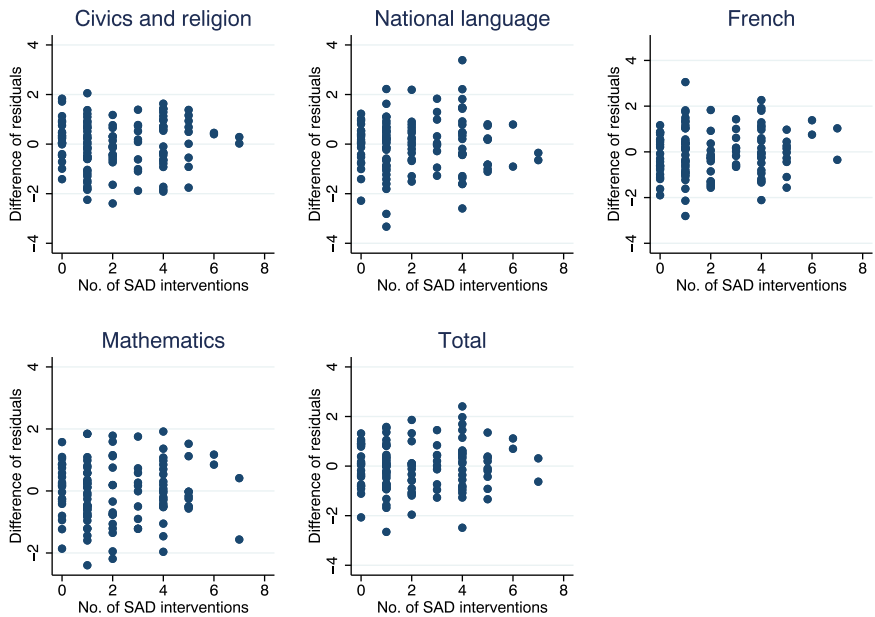

Figure B1: Residuals of main Diff-in-Diff and number of single SAD interventions. All figures exclude one outlier who received 22 single interventions. First difference of residuals are calculated from the model shown in Table 6, Panel B.

Appendix C: Supplementary information on school outcomes

Table C.1: Description of learning objectives, by subject and grades

Mathematics		
I-II grades	*III-IV grades*	*V-VI grades*
identify, count, name and compare objects, read and write numbers in digits from 0 to 100;	count, name and compose objects, read and write numbers from 0 to 100,000, write the numbers from 0 to 10,000 in letters;	compose, name, compare, read and write large numbers in letters and numbers;
add, subtract, multiply and divide numbers between 0 and 100;	perform mentally and in writing the fundamental operations on decimals and simple fractions;	perform mentally and in writing the operations on decimals and fractions;
compare, measure, estimate, evaluate lengths, masses and capacities, tell the time and use the national currency;	estimate and measure, volumes, lengths, capacities, time and monetary values;	establish the relationships between the different measures of magnitude;
locate herself or locate an object in space by following instructions;	identify and construct geometric figures, calculate their perimeter and various dimensions;	identify and construct geometrical figures and bodies, calculate their dimensions, perimeter, area and volume;
fold, cut out, draw geometric shapes; make traces freehand or using a ruler; solve problems with simple statements.	solve simple problems.	solve complex problems.
Civic education and religion		
I-II grades	*III-IV grades*	*V-VI grades*
name and identify the people who make up the family, the people who run the schools, health centres or churches, the local authority municipality (territory);	recognize her duties and rights vis-à-vis society (in family, at school, etc.);	situate herself in society as a human person and citizen of a nation;
locate the school, church, health centre, family home, market;	know, love and serve her homeland, the Dem. Rep. of Congo;	know some national, African and international institutions;

(Continued.)

Table C.1: Continued

Civic education and religion		
I-II grades	*III-IV grades*	*V-VI grades*
identify the national flag; sing the national anthem of the Dem. Rep. of Congo; carry out public utility work at school, with the family, in the neighbourhood or in the town; distinguish between good and evil, order and disorder; practice good manners and social habits, manifest civic and good moral attitudes.	apply the school regulations, the rules of politeness, courtesy and traffic road; develop the important virtues of life in society; preserve the environment and protect nature (fauna and flora) and public goods.	know and explain some of the rights of the child; analyse the fundamental values of democracy; identify their cultural values and those of others; appreciate the quality and usefulness of the information disseminated by the media; identify the moral rule from reading texts, situations, fables, tales and proverbs; find the motive for the moral act, the means necessary to accomplish it, its consequences.
National local languages		
I-II grades	*III-IV grades*	*V-VI grades*
understand a message expressed in the national or local language and react to it; express orally in the national or local language that one can use to communicate fluently with those around herself; read and write and understand words, sentences, and texts; produce simple texts in real or simulated communication situations; demonstrate behaviour, skills, and attitudes compatible with the cultural values conveyed by the language.	understand and respond to a message expressed orally or written; fluently express herself orally or in writing in a familiar or daily situation fluently read and understand a text; produce sentences or texts expressing her ideas, her thoughts, her feelings.	easily tell a story, a fact; communicate in a correct way orally or in writing; fluently and correctly read texts and reports; produce texts, brief reports, letters.

(Continued.)

Table C.1: Continued

French language		
I-II grades	*III-IV grades*	*V-VI grades*
understand and respond to an oral message; express orally, in simple and correct French, what she can communicate fluently with her entourage; chexpress by gestures, acts, behaviour, and attitudes what is said in French by another person; orally answer to the questions asked.	assimilate the fundamental functioning elements of the French language; master the nature of words, sentences, their grammatical and syntactic function which will enable her to understand the message, speak, read and write correctly.	understand a text or information related to everyday life; read a simple text, at least one page long, and prove that she understands it; identify words and phrases by their nature and grammatical function; correctly conjugate verbs of common use; correctly spell previously explained words and texts; compose sentences or short texts according to a model.

Table C.2: Maximum raw scores achievable, by grade and subject

First / Second Grade				
	Term 1	Term 2	Term 3	Final
Civics and religion	120	120	120	360
National languages	200	200	200	600
French	160	160	160	480
Mathematics	200	200	200	600
Total	1120	1120	1120	3360
Third / Fourth Grade				
	Term 1	Term 2	Term 3	Final
Civics and religion	120	120	120	360
National languages	120	120	120	360
French	280	280	280	840
Mathematics	200	200	200	600
Total	1120	1120	1120	3360
Fifth Grade				
	Term 1	Term 2	Term 3	Final
Civics and religion	120	120	120	360
National languages	80	80	80	240
French	280	280	280	840
Mathematics	280	280	280	840
Total	1200	1200	1200	3600