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Mali

DATA MUST SPEAK

Unpacking Factors Influencing School Performance

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Unpacking Factors
Influencing School Performance
in Mali

Acknowledgements

Data Must Speak research coalition of donors:

Contents

List of acronyms, abbreviations and initialisms

CAP	*Centre d'animation pédagogique* [pedagogical advice centre]
DEF	*Diplôme d'études fondamentales* [general education diploma]
DMS	Data Must Speak
EMIS	Education Management Information System
NORAD	Norwegian Agency for Development Cooperation
PRODEC 2	Programme décennal de développement de l'éducation et de la formation professionnelle deuxième génération [Second-Generation Ten-Year Programme for the Development of Education and Vocational Training]
SARPE	*Stratégie alternative pour le recrutement du personnel enseignant* [Alternative Strategy for the Recruitment of Teaching Staff]
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development

Executive summary

Mali faces many challenges in the field of education: difficult access and low completion rates in basic cycles 1 and 2,[1] poor learning conditions, and security problems leading to the closure of many schools. To overcome these challenges, the Ministry of Education drew up the Programme décennal de développement de l'éducation et de la formation professionnelle deuxième génération [Second-Generation Ten-Year Programme for the Development of Education and Vocational Training, or PRODEC 2] for 2019–2028, which aims in particular to improve access and retention rates in basic cycles 1 and 2 by reducing the pupil-teacher ratio, improving teachers' skills and the availability of textbooks, and making more teaching available in the national language.

Mali requested UNICEF's support, in the form of Data Must Speak (DMS) research, to carry out an analysis of its education system in relation to the objectives of PRODEC 2, and to develop innovative local solutions. The first stage of the DMS research in Mali – the outcomes of which are presented in this report – involved mobilizing, merging and analysing educational administrative data to identify the contextual factors and resources that influence school performance in Mali in terms of student retention and learning outcomes. The report presents the findings of the analysis of 2015–2019 Education Management Information System (EMIS) data concerning basic cycles 1 and 2 and the results of the examination that students sit at the end of basic cycle 2 to obtain the *diplôme d'études fondamentales* [general education diploma, DEF].

Looking at the promotion rate of students between grades, the repetition rate, the dropout rate (all calculated using EMIS data), and the transition rate from primary to secondary school, modelling of the factors influencing school performance has revealed associations that are worth thinking about when developing educational policies in Mali. These include, in particular:

Girls' success is associated with the presence of female teachers in their schools. This association is stronger in rural areas, where there are (relatively) fewer female teachers, demonstrating the need to work on deploying female teachers throughout the country. These findings suggest the existence of gender dynamics in Malian schools. Further research should be carried out to better understand them and help improve success for all learners.

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[1] Basic cycle 1 (from first grade to sixth grade); basic cycle 2 (from seventh grade to ninth grade).

Investment is needed in recruiting more teachers in order to reduce class sizes, and in purchasing more textbooks, but resource management must also be improved to make the most of these investments. Learner promotion rates are better when class sizes are smaller and when there are as many textbooks as there are students.

The findings are encouraging in terms of the positive effects of the use of national languages (curricular teaching), but this practice is still not widespread enough throughout the country.

Investing in better schooling conditions can improve promotion rates and reduce dropout rates. Learner promotion rates are higher when the school has a canteen, latrines (especially for girls) and fewer students per classroom.

The analysis also revealed that it might be necessary to collect more data, particularly on teacher characteristics, and to create a new variable (such as a unique identifier for each school) to link the EMIS to DEF results. **Strengthening EMIS data collection by including more information on teachers could enable more in-depth analyses to be carried out in the coming years, and the effects of teacher recruitment reforms to be assessed.**

This first stage of the DMS research in Mali allowed us to introduce the education system and to prepare for the second stage of the research, which involves identifying positive deviant schools based on data. These efforts will be supplemented with the collection of qualitative data on the positive deviant practices and behaviours observed in a sample of schools, with a view to comparing positive deviant schools with non-positive deviant schools in the third stage of the research. The final stage of the research will identify levers for scaling up the good behaviours and practices identified in positive deviant schools in Mali.

1. Introduction and context

Introduction and context

1.1 Overview of the DMS research in Mali

Mali's education system aims to guarantee universal and equitable access to quality education for all school-age children in Mali. In Mali and in all other countries, achieving this objective, which is part of Sustainable Development Goal 4 (SDG 4), requires the implementation of national strategies and programmes that are relevant to the social and economic context at play to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all".

Through its interventions, UNICEF helps countries progress towards this goal by supporting them in carrying out innovative activities and by monitoring implementation. The DMS initiative, which UNICEF has led since 2014, provides ministries of education with specific technical support and capacity-building for more effective use of data on schools and national systems, through UNICEF's headquarters, regional offices and country offices. This initiative includes a research component coordinated by UNICEF Innocenti, which aims to implement methodologies for identifying and sharing the approaches taken by positive deviant schools in collaboration with ministries of education.

Thanks to financial support from NORAD, Mali has been taking part in this research since 2021 with a view to strengthening its action plan for the implementation of PRODEC 2 for 2019–2028. To guide the research activities, a multidisciplinary team called the DMS Advisory Group was set up. Made up of staff from several departments of the Ministry of Education, local researchers and UNICEF (Mali Country Office and UNICEF Innocenti), this group jointly defined the objectives of the research and its scope in Mali. It also actively participated in the various stages of implementing the research.

1.2 The Malian education system

Basic cycles 1 and 2, which form part of Mali's education system and are the main focus of the analysis presented in this report, are managed by the Ministry of Education. Within these cycles, there are four types of school: public schools, private schools, community schools[2] and madrasas.[3] The Ministry of Education, whose schools are the subject of this analysis, operates within a decentralized system. Pedagogical advice centres (CAPs) are local facilities that have direct contact with schools. They are supervised at the regional level by a teaching academy, which acts as the technical body representing the Ministry. The Ministry of Education supervises these teaching academies directly.

Basic education, for children aged 6 and over, aims to improve the basic learning skills that help students to gradually develop their intellectual, physical and moral autonomy, preparing them for further education or the world of work. It is compulsory for all children and lasts for nine years. There are two cycles: the first cycle, called "basic cycle 1" in this report, lasts six years and is designed to prepare students for the second cycle, or "basic cycle 2", which lasts three years. To proceed to secondary education, children

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[2] As their name suggests, community schools are schools run by the community, but in which civil servant teachers may be employed. In Mali, the number of community schools continues to fall as they are gradually being converted into public schools.

[3] Madrasas are formal educational institutions that follow official curricula and are subject to the same assessments as conventional schools. They are overseen by the Ministry of Education.

must pass the DEF at the end of basic cycles 1 and 2. The analyses in this report focus on basic education.

In Mali, there are five different statuses for teachers: government or local authority civil servant (43.3 per cent), teacher on a contract or supply teacher (54.1 per cent) and trainee teacher (2.6 per cent). In the public sector, all teachers must be trained, either at a teacher training institute or through training for contract teachers organized under the *Stratégie alternative pour le recrutement du personnel enseignant* [Alternative Strategy for the Recruitment of Teaching Staff – SARPE].[4] Trainee teachers complete their training at a teacher training institute. There are also some untrained teachers in the public sector, but little information is available about them.

Teacher training, particularly of those in the basic cycle, remains an important aspect of the education system. It takes place within the framework of conventional education and is provided by specialist institutions such as teacher training institutes and or the *École de formation des educateurs préscolaires*, which trains preschool teachers. Trainee teachers are recruited by competitive examination, for which applicants must have a DEF (four years) or baccalaureate (two years). Teachers can continue their studies at specialized or general higher education structures, working towards a bachelor's degree, master's degree or PhD.

In basic cycles 1 and 2, community organizations are an integral part of school management. School management committees, through the school development project, are responsible for keeping the school environment clean, drawing up a list of school equipment needs and, where necessary, financing purchases. In addition

to their respective school management committees, some schools have mothers' associations, which aim to promote girls' enrolment in school and are often responsible for running the school canteen. Finally, learning communities, which provide a framework for continuous education for teachers within one or more schools in the same community, are also used – mainly in basic cycle 1.

1.3 Challenges facing the Malian education system

With a view to developing and implementing PRODEC 2, an assessment of the education and vocational training sector identified a number of issues and challenges, including the need to:

Improve teacher training and management and find ways of motivating staff and recruiting sufficient numbers of teachers, while introducing information and communication techniques

Increase education delivery while ensuring quality and equity [...]

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[4] The SARPE programme, launched in 1990, was aimed at holders of a vocational diploma, technical diploma or general education diploma (DEF). Staff recruited under this programme received three to six months of teacher training. The SARPE programme ended in 2010. For more information on this programme, please visit: https://docplayer.fr/15703734-La-formation-des-enseignants-contractuels-sarpe-mali.html [available in French].

Strengthen governance of the education and vocational training sector, while ensuring ongoing dialogue among all stakeholders [...].[5]

Analysis of the data from the rapid data collection[6] (which differs from the EMIS data collection described in Appendix 1) contained in the *Rapport de suivi des indicateurs du système educatif de 2016-2017 à 2020-2021* [Education System Indicators Monitoring Report 2016–2017 to 2020–2021][7] reveals that the rate of access to the first year of basic cycle 1 (i.e. the gross admission rate) in 2020–2021 was 69 per cent. This rate fell by 2 percentage points compared with 2019–2020, reflecting the difficulties faced by the system in coping with the various crises (predominantly those relating to security) that led to the closure of several schools.

The same analysis also shows some disparity between girls and boys, with a gender parity index of 0.95 in 2020–2021 (0.87 in 2018–2019). This trend in the gross admission rate is also reflected in the gross enrolment rate, which peaked at 80 per cent in 2018–2019, before falling slightly to 78.6 per cent in 2020–2021 (see **Figure 1**). This drop can mainly be seen among boys (from 86 per cent to 83 per cent) – on the contrary, the gross enrolment rate increased among girls (from 74 per cent to 75 per cent). To a certain extent, these low gross admission rate and gross enrolment rate figures are linked to certain public schools functioning poorly and several schools closing due to insecurity in the surrounding area.

Data collected by the Education Cluster in 2021 show that 19 per cent of schools closed throughout the country.[8]

In basic cycle 2, the gross admission rate has been falling steadily in most regions since 2018–2019. It reached a national average of 38.6 per cent in 2020–2021. For girls only, this figure is 37.5 per cent. Only the district of Bamako has a much higher rate (87.9 per cent), which can be explained by the flow of learners to Bamako, a phenomenon that helps boost admission. The other regions of the country all have rates below 50 per cent. The gross enrolment rate also remains below 50 per cent for all regions, with the exception of Bamako (101.7 per cent) and Koulikoro (70.8 per cent). The national average is 47.9 per cent for all students and 45 per cent for girls alone.

Access to education therefore remains a major challenge, but efforts are being made to eliminate the various obstacles hindering the sector, and to provide children with alternative educational solutions. Completion rates in basic cycle 1 are also encouraging, rising from 48 per cent in 2016–2017 to 51.6 per cent in 2020–2021. However, figures vary significantly between regions. Only Bamako (89.9 per cent) and Koulikoro (67.7 per cent) are above the national average, while Kidal (10.7 per cent), Mopti (24.3 per cent) and Timbuktu (26 per cent) have the lowest rates. The completion rate for basic cycle 2 has also improved, rising from 34.4 per cent in 2016–2017 to 36.2 per cent in 2020–2021. In 2021, the district of Bamako and the region of Koulikoro had the highest completion rates (79.3 per cent and 79.9 per cent, respectively), while the region of Kidal had the lowest (2.6 per cent). The completion rates in the other regions are also lower than the national average (36.2 per cent).

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[5] Programme décennal de développement de l'éducation et de la formation professionnelle deuxième génération [Second-Generation Ten-Year Programme for the Development of Education and Vocational Training, or PRODEC 2] 2019–2028, 2019, pp. 37–38.
[6] Data taken from reports written by school head teachers at all levels of education after the start of the school year, and traced back to the teaching academy level.
[7] Published in April 2021 by the Ministry of Education.
[8] Presentation of the monthly meeting of Mali's Education Cluster, January 2022.

Figure 1: Gross enrolment rate in basic cycles 1 and 2
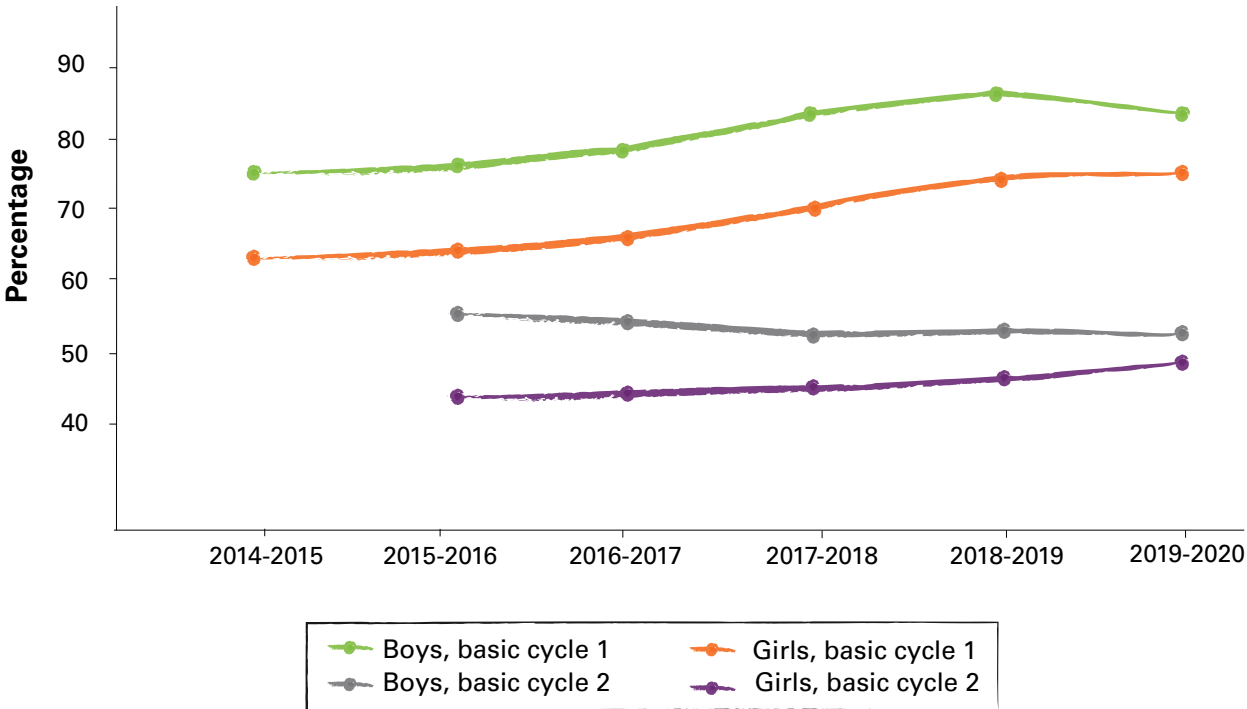
Source: Rapport de suivi des indicateurs du système éducatif de 2016-2017 à 2020-2021 [Education System Indicators Monitoring Report 2016–2017 to 2020–2021].

1.4 Education policies and current reforms

With the adoption of PRODEC in 1998, Mali embarked on the biggest educational reform the country had seen since 1962. This programme has since been revised to become PRODEC 2, covering the period from 2019 to 2028.

To improve the quality and delivery of education, qualified teachers must be available in sufficient numbers. With this in mind, the number of functional teacher training institutes has been increased.

There are also plans to raise the training school entry requirements from DEF to baccalaureate. In addition, PRODEC 2 is working towards implementing a bac+3 model (three years of university study culminating in a bachelor's degree) by 2030. A vocational degree will become the basis for recruiting teachers in the basic cycle.

Finally, the Ministry of Education is working to further promote bilingual teaching programmes in basic cycle 1. Phases two and three of PRODEC 2 will be spent consolidating the bilingual education programme and gradually extending it throughout the country.

2. Research objectives

Research objectives

2.1 Research stages

The DMS research on positive deviant schools, implemented in close partnership with the Ministry of Education, is based on an observation that applies to all education systems: some schools achieve exceptional results despite the resources available to them and the contexts in which they operate. These outliers are known as 'positive deviant' schools, and the improved outcomes they achieve are likely facilitated by specific practices and behaviours employed either within the school (e.g.,

school management practices and/or pedagogical approaches) or in relation to the school (e.g., parental and community involvement).

The DMS research in Mali identifies these positive deviant practices and behaviours with a view to deploying them more widely. This research is broken down into five stages, with literature reviews in each one, as illustrated in **Figure 2**.

Figure 2: Stages of the Data Must Speak research in Mali

Stage 0

Literature review and overall methodology

Stage 1

Quantitative analysis
Identification of the resources and context associated with school performance

Stage 2

School typology
Identification of positive deviant schools

Stage 3

Behavioural sciences
Identification of positive deviant behaviours/ practices within the selected schools

Stage 4

Implementation research
'How' to scale up positive deviant practices/ behaviours (science of scaling up)

Stage 5

Use of findings
at the national level and dissemination to all stakeholders

This first report focuses on the results of the quantitative research (stage 1), which involved analysing administrative data from the Malian education system to identify school inputs correlated with better learner performance in basic cycles 1 and 2. This analysis should offer education policy insights to Malian decision-makers as it quantifies the positive effects of policy changes on specific aspects of the education system (e.g., gender, community participation).

However, it is clear that administrative data are limited in the extent to which they can explain school performance, and that a second qualitative phase (stages 2 and 3) is needed to deepen understanding of the behaviours and practices observed within positive deviant schools.

The second phase, devoted to the analysis of qualitative data collected in a sample of schools, will highlight the human factors (such as teaching practices, community activity and school management) that allow these schools to perform better than other schools with similar characteristics. These positive deviant schools have specific organizational and functional features that enable them to achieve better-than-average results; identifying these features could help improve other schools, and the Malian education system in general (stage 4). The results of the second phase of research will be published in another report.

The research questions guiding this first report, defined jointly with the DMS Advisory Group, are as follows:

Question 1	Do the conditions of basic education in Mali have an effect on learner performance?
Question 2	Does the Malian education system integrate gender efficiently, for example in terms of teacher distribution?
Question 3	Does integrating national languages at the start of basic cycle 1 improve learning?
Question 4	What effect do community structures, such as school management committees and mothers' associations, have on learner performance?

3. Data and descriptive statistics

Data and descriptive statistics

3.1 Presentation of databases: EMIS and exam results

The quantitative analyses presented in this report are based on two administrative databases produced by the Ministry of Education: EMIS and the DEF exam results database.

EMIS data are collected every year under the supervision of the Ministry of Education, with the participation of teaching academies, CAPs and the head teachers of all basic schools in Mali. The EMIS database is longitudinal, and records a vast number of variables for each school, including information on students, teachers, the head teacher, the resources allocated to the school, and the community's involvement in school management.

As part of the DMS research, the research team and the Ministry of Education merged the EMIS and DEF databases over four years (2015–2019). The unit of observation is the grade, by gender, in a given school and for a given school year.[9] The merged database used in this report contains 161,536 observations for basic cycle 1 schools and 31,560 observations for basic cycle 2 schools.

The process of collecting these data from the EMIS, the information contained in the databases and its limitations, and how the basis for the quantitative analysis is created are described in more detail in Appendix 1.

3.2 Modelling of performance factors

3.2.1 Presentation of the performance variables used

As part of this analysis, and in close consultation with the Ministry of Education, four key performance variables were selected.

Promotion rate

The promotion rate is the percentage of learners (male and female) in a given class who move up to the next grade. Promotion rates averaged 73.2 per cent in basic cycle 1 and 64.2 per cent in basic cycle 2 in 2018–2019[10] in public, private and community schools and madrasas. The promotion rate is a key indicator for the Malian education system. Students who do not advance to the next class have either repeated a year (which represents an academic failure and a significant cost to the education system) or dropped out of school (which goes against the objective of ensuring education for all). The promotion rate is the main performance indicator, as it can be calculated for all levels and forms part of this goal.

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[9] For example, characteristics of girls in the first grade of the basic cycle in school X for the 2015/16 school year.

[10] The latest available data correspond to the promotion rates recorded between the 2018/19 and 2019/20 school years.

Repetition rate

In Mali, the decision to repeat a year in basic cycles 1 and 2 is based on the results of each term's schoolwork. A high repetition rate is therefore an important indicator for the country's education sector. Repeating a year can be linked to factors such as learning conditions, the learner's home environment and the learner's health. The repetition rate was 14.5 per cent in basic cycle 1 and 22 per cent in basic cycle 2 in 2018–2019.

Dropout rate

Dropouts in basic cycles 1 and 2 reflect an issue in the Malian education system. They are generally linked to a school environment that is not conducive to student development. Unsurprisingly, the more that students drop out of school, the less they learn. Dropout rates in Mali are 11.3 per cent and 14.6 per cent in basic cycles 1 and 2, respectively.

Average grade in DEF examination at the end of basic cycle 2

The DEF examination at the end of basic cycle 2 is standardized throughout the country. The results of this examination are therefore a reliable indication of the level of student learning, but only for those who reach this point (ninth grade).

3.2.2   Construction of performance variables

Promotion rate

The promotion rate, disaggregated by gender, can be calculated by tracking a cohort of learners over a number of school years. Learners who are in grade t in year N should be in grade t+1 in year N+1. The promotion rate can thus be estimated by comparing the enrolment of two consecutive school years for two consecutive grades for the same school. Students repeating a class in year N+1 are subtracted from the total number of students enrolled because they are not part of the cohort of learners who have just moved up.[11] It is not possible to calculate the promotion rate at the end of basic cycles 1 and 2, as only some schools teaching basic cycles 1 and 2 have a t+1 grade beyond this.

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[11] This method of estimating the promotion rate gives satisfactory results, but may be biased if there are errors in the number of students enrolled or the number of students repeating a year. Moreover, it is impossible to know how many new students have enrolled in a school or whether students who leave a school do so because they have dropped out or because they are transferring to a different one. This analysis is based on the assumption that school transfers are relatively rare and that changes in promotion and dropout rates capture differences in performance across schools.

For the last grade in basic cycle 1, the transition rate to basic cycle 2 was used as an approximation of the promotion rate. For the last level of basic cycle 2, the DEF pass rate was used to estimate the promotion rate.

Dropout rate

It is assumed that students who have not moved up or repeated a year have dropped out. The dropout rate is therefore calculated as follows: 100 - promotion rate - repetition rate.

Repetition rate

The number of students repeating a year is available for each grade, disaggregated by gender. As such, we can calculate the repetition rate by class and by gender by dividing the number of students repeating a year in grade t in year N+1 by the number of learners in grade t in the same school in year N.

DEF grade

The school average of grades out of 20 in the DEF assessment was calculated for girls and boys separately and linked to the class characteristics for ninth grade (basic cycle 2). Exam results are available for the 2017/18 and 2018/19 school years. The DEF average grade is available for 3,437 of the 4,618 schools teaching ninth grade, and stood at 8.19 with a standard deviation of 1.93 in 2018–2019 (see **Figure 3**).

Figure 3: Trends in DEF pass rate, by gender
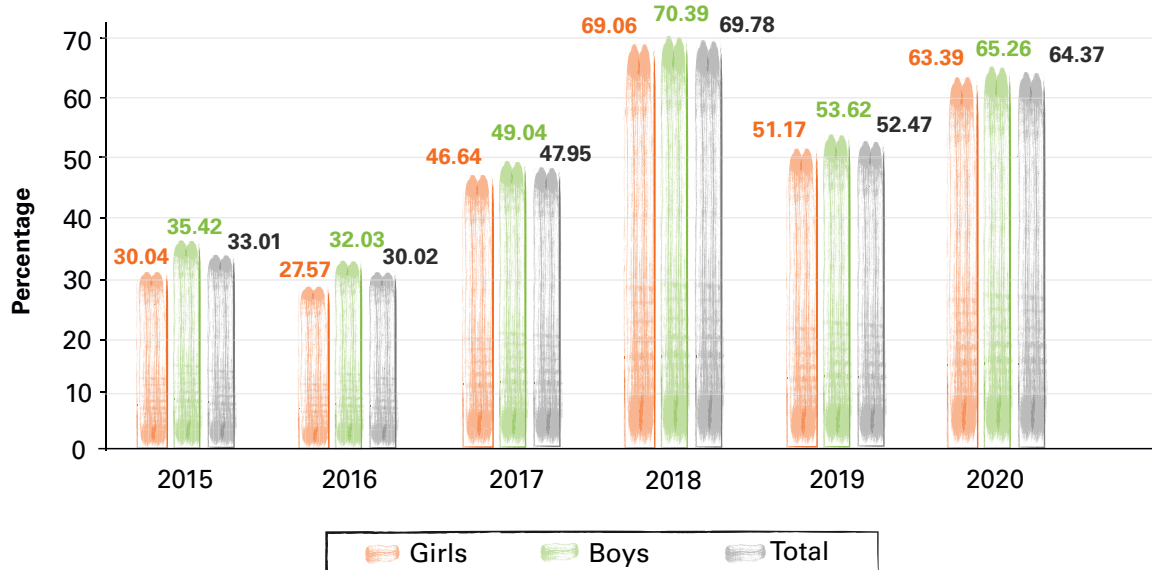
Source: Calculations by the authors based on administrative databases (exams and EMIS).

3.3 Descriptive statistics about the database

3.3.1 Basic cycle 1

Figure 4: Learner performance in basic cycle 1, in percentages

National promotion rate

Boys 73%
Girls 74%

0 10 20 30 40 50 60 70 80 90 100

Percentage

Nationally, Urban area, Rural areas, Remote rural areas, Public schools, Private schools, Community schools, Madrasas, Boys, Girls

🔵 Promotion rate   🟡 Repetition rate   🔴 Dropout rate
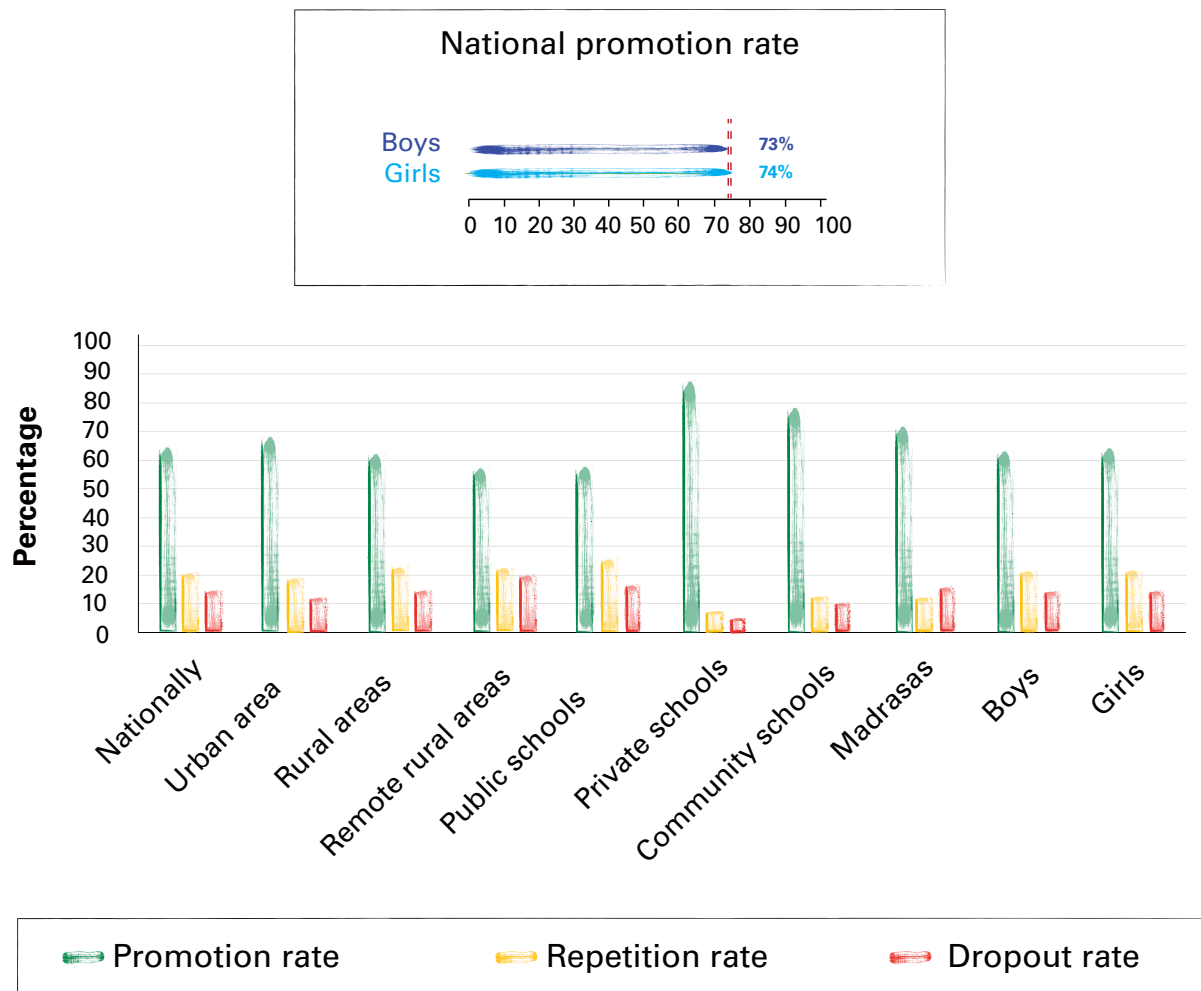
Source: Prepared by the authors using 2018–2019 EMIS data.

The rate of promotion in basic cycle 1 is higher in private schools (85.8 per cent) than in other types of schools (around 70 per cent). Overall, although the rate for girls (73.5 per cent) is slightly higher than the rate for boys (72.9 per cent), these figures are comparable (see **Figure 4**). In rural and remote rural areas, the further the school is from the CAP, the lower the rate.[12]

In public schools, the teachers are mostly civil servants, while private schools, community schools and madrasas employ more teachers on contracts. With regard to gender issues, it is important to note that women account for only 32.1 per cent of teachers in basic cycle 1. There are more female teachers in urban areas; in rural areas, the more remote the schools are, the fewer female teachers they employ.

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[12] For the purposes of this analysis, the research team considers rural areas to be less than 35 km from their CAP, and remote rural areas to be more than 35 km from their CAP.

The percentage of female teachers remains more or less the same across public and private schools (around 35 per cent), but is relatively low in community schools and madrasas. Trainee teachers from teacher training institutes are involved in teaching basic cycle 1, but in very small numbers (2.6 per cent). The majority of SARPE teachers work in the public sector (see **Figure 5**). In terms of teaching methods, conventional education is the most widespread in Mali. Nevertheless, 15 per cent of schools – mainly public and community schools – practise curricular teaching.[13] Teaching of mixed-grade classes is also practised in public schools (14.1 per cent), community schools (31.8 per cent) and madrasas (16.1 per cent). Only a small proportion of students (3.6 per cent) attend schools that have a double-shift system (see **Figure 6**).

Figure 5: Percentage breakdown of teachers by gender and status in basic cycle 1

Legend:
- Female teachers
- Trainee teachers
- Civil servants
- Teachers with a DEF or higher
- Teachers on contracts
- SARPE teachers
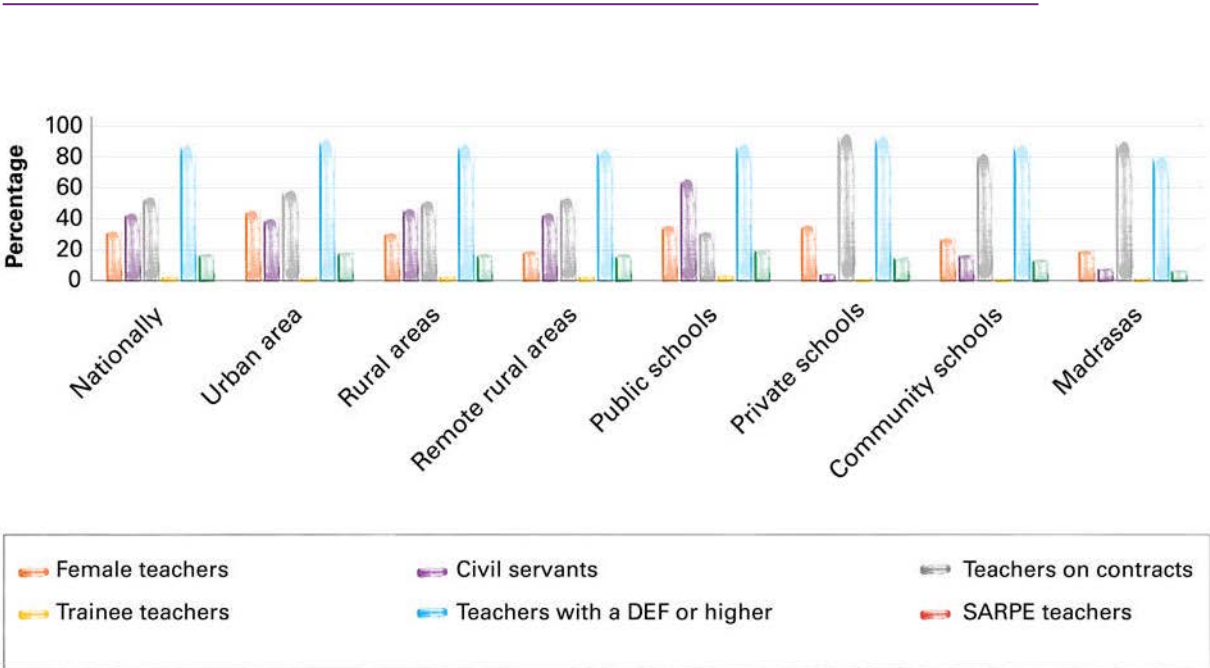
Source: Prepared by the authors using 2018–2019 EMIS data.

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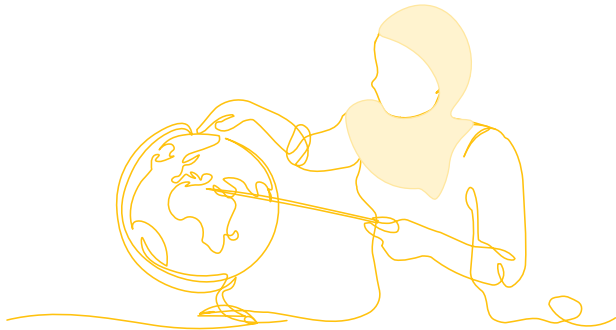
13 Curricular teaching involves the use of national languages in basic education for level I (first and second grade).

Figure 6: Proportion of non-conventional forms of education in basic cycle 1, in percentages
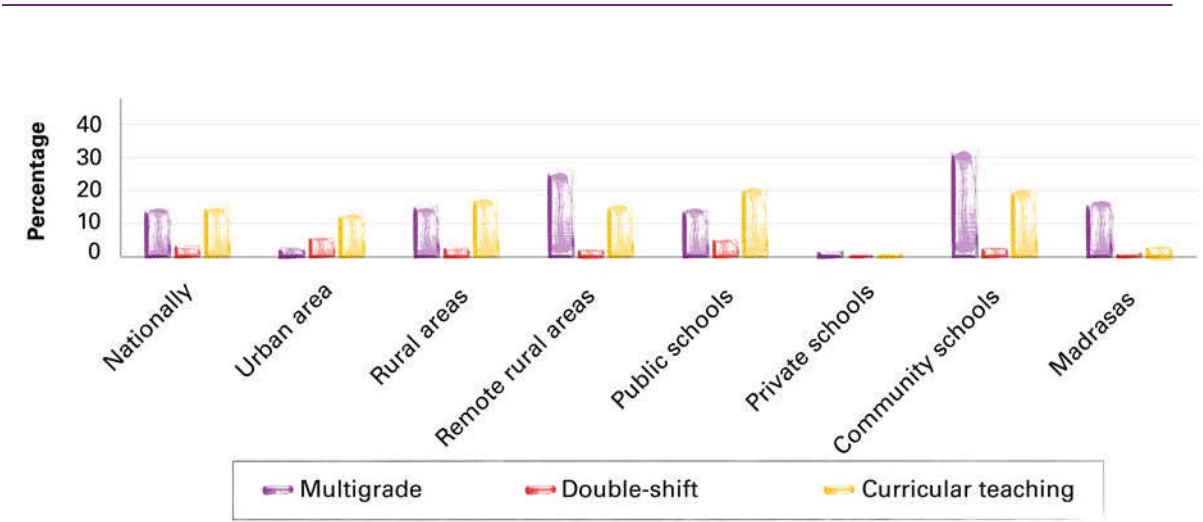
Figure 7: Presence of community structures in basic cycle 1, in percentages
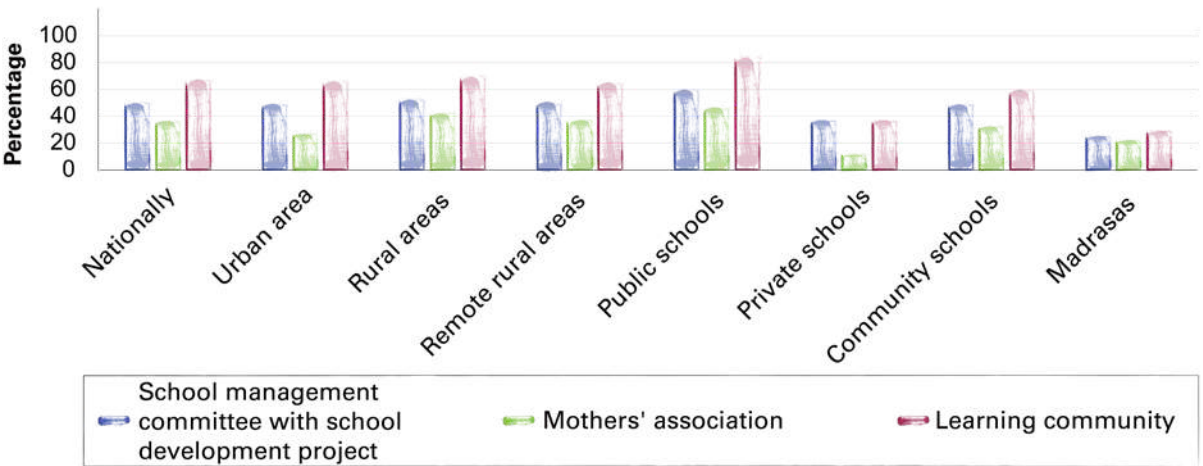
Source: Prepared by the authors using 2018–2019 EMIS data.

With regard to the presence of community structures in schools teaching basic cycle 1, over 90 per cent of community schools and 69.1 per cent of madrasas have a school management committee. However, having a school management committee does not always translate into school activities, as shown by the low number of schools with both a committee and a school development project. The presence of mothers'

associations and learning communities is relatively uniform across the different types of school. Mothers' associations are least prevalent across Mali, but there are more learning communities in rural areas, where the Ministry of Education recommends them the most (see **Figure 7**).

In basic cycle 2, as in basic cycle 1 (see above), the promotion rate is higher in private schools (88.1 per cent) than in other types of school.

There is also a notable difference in the promotion rate between urban areas (69.2 per cent) and rural and remote rural areas (62.1 per cent and 57.2 per cent, respectively). As in basic cycle 1, boys and girls have similar promotion rates (see **Figure 8**).

There are also fewer female teachers (15.5 per cent) than male teachers in basic cycle 2. There are very few of them in rural areas; most of them work in urban areas, in public schools. Trainee teachers, on the other hand, are mainly found in public schools and rural areas, where schools are short of teachers (see **Figure 9**).

Figure 8: Learner performance in basic cycle 2, in percentages
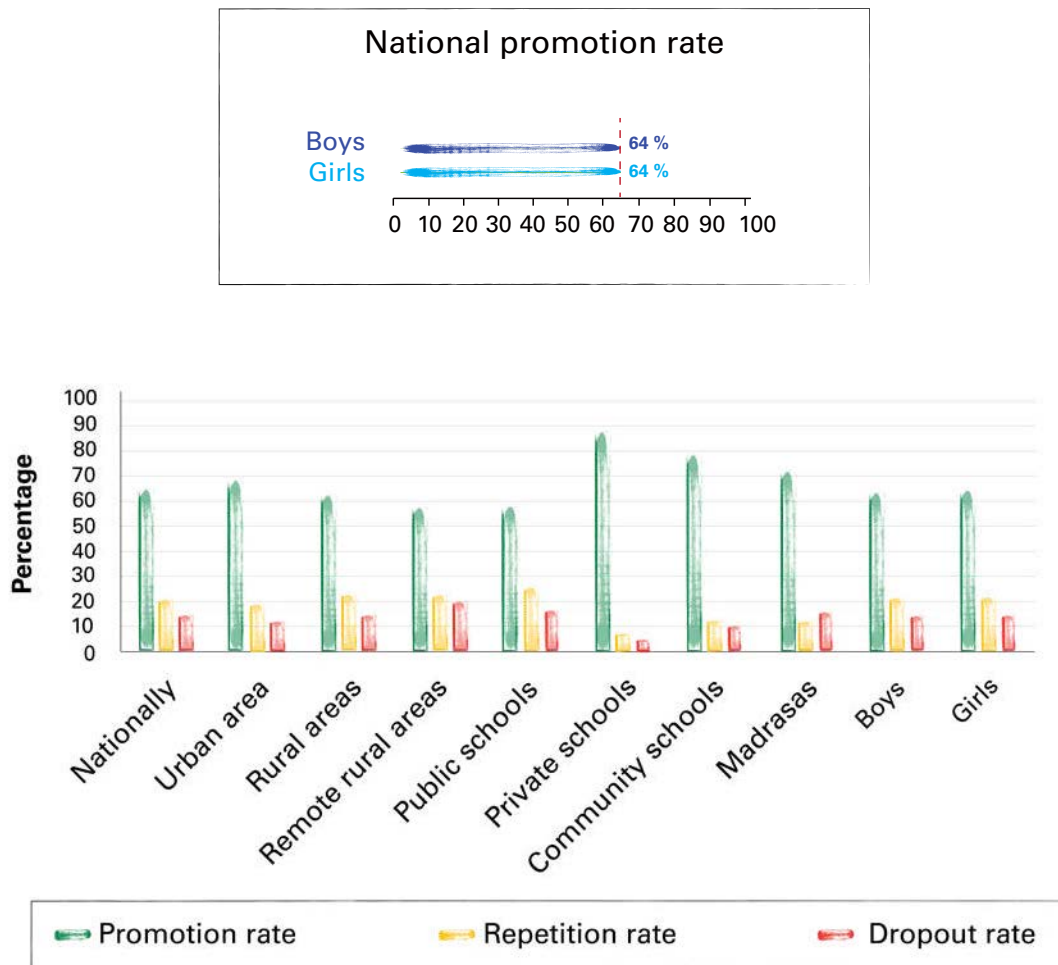
Source: Prepared by the authors using 2018–2019 EMIS data.

Figure 9: Percentage breakdown of teachers, by gender and status in basic cycle 2

- Female teachers
- Teachers on contracts
- Civil servants
- Trainee teachers
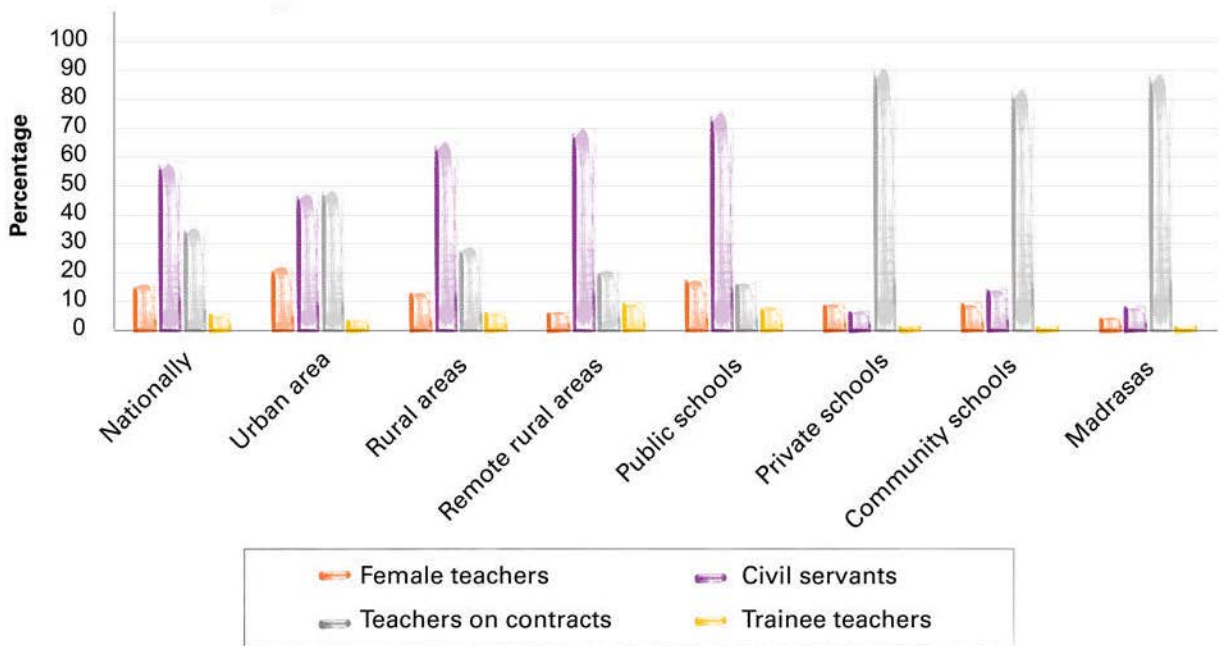
Figure 10: Presence of community structures in basic cycle 2, in percentages

- School management committee with school development project
- Mothers' association
- Learning community
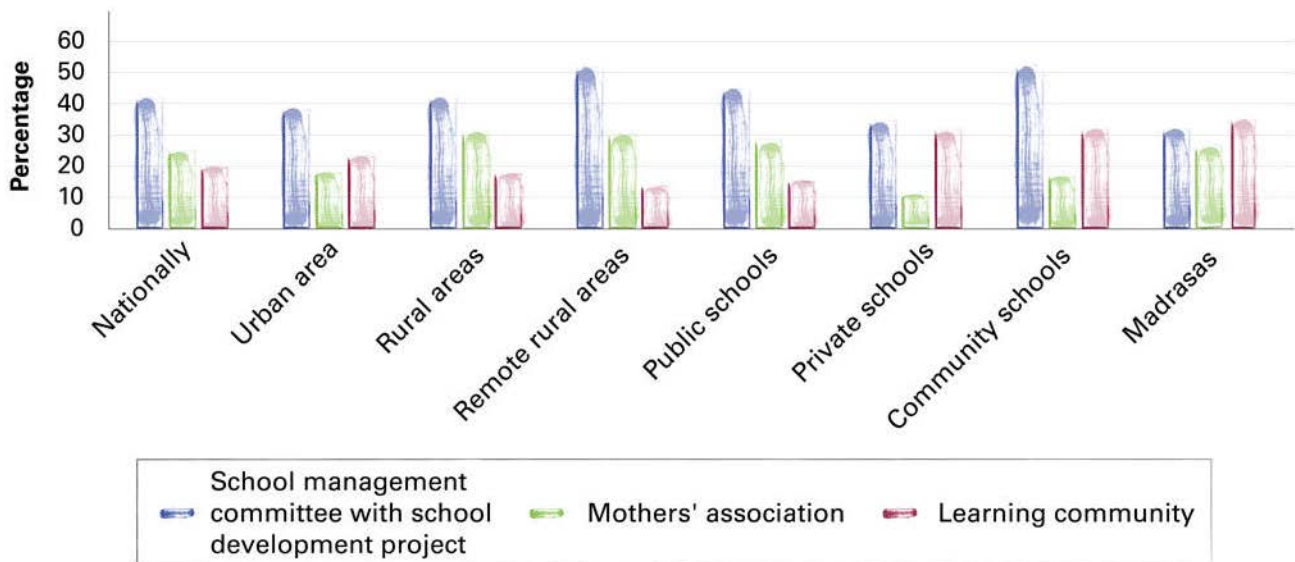
Source: Prepared by the authors using 2018–2019 EMIS data.

Finally, when it comes to community structures in basic cycle 2, the presence of school management committees remains relatively similar across the different school types and environments (see **Figure 10**). However, there are significantly fewer learning communities in basic cycle 2 than basic cycle 1. The gap is greater in public schools (84 per cent in basic cycle 1, compared with 15 per cent in basic cycle 2).

4. Results

Findings

This section of the report highlights the results of the econometric models described above. They reveal the contextual and resource-related factors associated with the performance variables (promotion to the next class expressed in percentage points, repetition and dropout rates, and average score out of 20 obtained in the DEF assessment) in basic cycles 1 and 2. You can consult all the results from the econometric models in the appendices to the report (Appendix 3).

Methodology for modelling performance factors

In order to evaluate the factors associated with student performance,

multivariate models based on Ministry of Education administrative data were developed. Explanatory variables were selected based on their relevance to the research questions, variability, data quality, low non-response rate and association with the performance variables. The goal was to estimate as accurately as possible the relationship between variables of interest (such as class size or number of textbooks per student) and performance variables (such as promotion rates or DEF results), which can inform policy decisions.

Ideally, we would be able to interpret the estimated coefficients as causal effects rather than simple correlations, but this is very difficult to achieve in observational data analysis. For example, while we observe that students perform better when they

have textbooks, this does not necessarily mean that distributing more textbooks will improve academic results. It is possible, for example, that schools with more textbooks also

have better school facilities (such as blackboards or seating capacity). In order to establish a causal link between textbook availability and student performance, it is necessary to take into account other variables such as school equipment, and to compare schools with similar educational provisions. However, even when controlling for other variables, it is possible that there are unobserved variables in the EMIS database, such as the managerial abilities of the head teacher, which correlate with the presence of textbooks and good educational performance. If this is the case, the positive relationship we observe between these two variables could be due to the fact that schools with more textbooks are also better managed, so distributing more textbooks would not have the desired effect.

In order to reduce this type of bias, the model includes school-level fixed effects. In practice, we have data for several years and levels, as well as data disaggregated by gender,

for each school. This allows us to introduce school-level fixed effects into the models in order to control for all the factors that are stable over time (for example, poverty within the area considered or families' level of satisfaction with the school). Because the school fixed effect controls for all parameters that are stable over time, the relationships are estimated based on how the parameters vary within schools (either over time, between different levels, or between girls and boys). For example, given that the availability of textbooks in the same school varies between grades and over the years, the model will estimate for each school whether performance is better for the grades and years in which more textbooks are available. Each school therefore carried out its own controls, which ensure that the relationships observed between the variables of interest and the performance variables are not due to systematic differences between schools.

These strategies – data richness and school-level fixed effects – help minimize the chances that the estimated coefficients are simple correlations, even if it is impossible to say with certainty that the estimated effects are causal. However, quantifying the relationship between school inputs and school performance is extremely important for public policymaking, as it allows us to assess which actions are most likely to improve the education system.

4.1   Learner gender

The promotion rate for girls is as good as, if not better than, that for boys in basic cycle 1 (73.5 per cent for girls versus 72.9 per cent for boys). However, the lower number of girls in primary school, particularly in first grade (46.6 per cent), shows that access to school remains an obstacle for girls in Mali. In addition, dropout rates are slightly higher for girls (12.1 per cent) than for boys (11.5 per cent), indicating that they are more likely to drop out of school rather than repeat a year if they fail the year. In basic cycle 2, promotion rates for girls and boys are identical (64.2 per cent), but boys achieve slightly better results in the DEF exam.

Girls' and boys' success is associated with the gender of the teacher: the higher the proportion of female teachers in the school, the higher the promotion rate for girls, but the lower the promotion rate for boys. If a school went from 0 per cent to 100 per cent female teachers, the promotion rate would increase by 2.2 percentage points for girls, but drop by 3 percentage points for boys. With the exception of private schools, this result is observed across all school types, with a particularly strong estimated coefficient in madrasas, where the number of female teachers is relatively low (19.7 per cent, compared with 32.1 per cent nationally). The positive relationship between the presence

of female teachers and the promotion rate for girls also varies according to place of residence, with much more pronounced correlations in rural and remote rural areas, where the proportion of female teachers is also lowest (30.8 per cent and 18.7 per cent respectively, compared with 45.4 per cent in urban areas).

These differentiated relationships between girls and boys according to the gender of the teacher appear in basic cycle 2 and affect the promotion, repetition and dropout rates, but they are not statistically significant when the average score obtained in the DEF exam is used as the performance variable. In basic cycle 2, the proportion of female teachers is relatively low (15.5 per cent), but the results suggest that girls do much better than boys when the number of female teachers increases. As in basic cycle 1, the relationship between the proportion of female teachers and the promotion rate of girls is particularly strong in rural areas, while there are no significant differences in urban areas.

The head teacher's gender also seems to have an effect on girls' education. In basic cycle 1, where 11.2 per cent of head teachers are women, the promotion rate for girls is higher when the head teacher is a woman (+0.5 percentage points), while the difference for boys is not significant. The results are less clear-cut in basic cycle 2, where the models show varying associations.[14]

The administrative data included in this analysis do not explain why learners' results are linked to the gender of the teacher, nor why learners seem to do better when they have a teacher of the same gender as themselves. It is possible that teachers' practices and behaviours may differ depending on the learner's gender; for example, it may be that female teachers encourage girls' participation, or that girls feel more confident when the teacher is a woman. Girls may also see their female teachers as role models. Finally, it is possible that the presence of more women in a school (as teachers or head teachers) helps foster a better school climate for girls, in particular in the form of greater attention to sexual harassment in the school environment.

It should be noted, however, that in both basic cycle 1 and basic cycle 2, the proportion of female teachers in the school is negatively correlated with the promotion rate for boys. In basic cycle 1, the combined association for boys and girls of the presence of female teachers in the school is negative (-0.7 points), but it is positive in basic cycle 2 (+1.7 points). If the main reasons why girls do better when they have female teachers are related to the fact that they can identify with a role model, or that the school climate is better for them, the gender of the teacher would probably not have an impact on boys. In Mali, 99 per cent of schools have at least one male teacher, and it is unlikely that boys will lack male role models or that improving the school climate for girls will affect boys negatively. **Thus, it is likely that both female and male teachers behave differently depending on the learner's gender. Taking greater account of gendered interactions between teachers and learners in teacher training could help improve educational outcomes for both girls and boys.**

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[14] Given the very low number of female head teachers in basic cycle 2, these results should be treated with caution.

The next stage of the DMS research in Mali, which will look at positive deviant schools, should help the Malian education sector better understand the reasons behind the associations observed. To expand on these findings and highlight women's prominent role in the region's education systems, UNICEF, in collaboration with the education ministries of several West and Central African countries, has launched research into women in learning leadership.[15]

Teacher characteristics

In addition to teacher gender, the administrative data used for these analyses also contain information on the status, training and academic level of teachers, but only for basic cycle 1. What's more, only information about the teachers who took part in the SARPE is available. It is important to note that 88.2 per cent of learners are taught by a teacher with a DEF or higher qualification. These rates are higher in more privileged environments (91.4 per cent in urban areas and 93.5 per cent in private education, for example). A DEF is the minimum level currently required for teacher recruitment. PRODEC 2 aims to increase recruitment at baccalaureate level.

The findings show no association between the proportion of teachers holding a DEF and the promotion rate in any type of school, with the exception of community schools. There, the findings suggest that the

promotion rate would be 2.4 percentage points higher if 100 per cent of teachers held a DEF or higher qualification, compared with a school with no trained teachers. However, the academic level of teachers is not statistically significant in the model explaining the promotion rate, and is associated with a higher repetition rate (+0.8 percentage points), but a lower dropout rate (-1.3 percentage points). This may mean that, although learners do not progress faster with more qualified teachers, they are less likely to drop out if they fail the year. The limitations of the available information mean that we cannot assess whether recruiting teachers at baccalaureate level, as envisaged in PRODEC 2, would be an effective strategy.

With regard to the status of teachers, it is interesting to note that teachers who are civil servants do not achieve better results than those on contracts or volunteer teachers in basic cycles 1 and 2. **In contrast, the coefficient associated with the proportion of trainee teachers is positive and statistically significant in basic cycles 1 (+5.5 percentage points if all teachers are trainee teachers) and 2 (+6.9 percentage points).** The coefficient associated with the proportion of trainee teachers is higher in rural than in urban areas, as well as in the public sector. It is difficult to pinpoint the reasons behind the positive results achieved by trainee teachers. It may be that regular monitoring and assessment of trainee teachers' work ensures good results, or that they are more motivated than regular teachers. **Lastly, a higher proportion of teachers that have received SARPE training is associated with a better promotion rate (+0.6 percentage points in basic cycle 1), reflecting the positive effect of this training**.

[15] See United Nations Children's Fund, 'Women in Learning Leadership', UNICEF, New York, <www.unicef-irc.org/research/women-in-learning-leadership>, accessed 13 November 2023.

4.2 Class size and teacher distribution

Larger class sizes[16] are associated with lower promotion rates: a reduction of 10 learners per class could improve the promotion rate in basic cycle 1 (+5 percentage points) and basic cycle 2 (+2 percentage points).[17] In Mali, class sizes tend to be very large (63.6 in basic cycle 1 and 81.8 in basic cycle 2), and even more so in urban areas (74.5 in basic cycle 1 and 82.6 in basic cycle 2). The effect of class size on the promotion rate seems to mainly be reflected in an increase in the dropout rate, with a smaller rise in the repetition rate. Large classes show negative associations in all subsamples tested, but they are particularly prevalent in community schools and tend to be more common in rural areas than urban areas.

Students in multigrade classes have slightly lower promotion rates than those in regular classes. However, for multigrade classes, the number of learners in the class is higher than the number of learners in the teaching group due to the presence of a second teaching group with an average of 23.7 learners. The results of the analyses show that the presence of these 23.7 additional learners from the other teaching group in the class is associated with a smaller drop in the promotion rate (-1.2 points) than if these learners belonged to the same teaching group (-11.3 points). In other words, students in multigrade classes do not seem to be heavily affected by the number of learners from another teaching group present in the class. **This suggests that having multigrade classes does not have a negative impact on students, and can be useful when there are few students per grade.**

The introduction of a double-shift system has a very negative effect on learner promotion rates (-6.5 percentage points) in basic cycle 1. Although only 3.6 per cent of learners are taught in a double-shift system, its use significantly reduces their teaching time as they are only in school for around 50 per cent of the time they would be otherwise. It is important to note that double-shift systems are linked to not only a lack of teachers, but also a lack of school infrastructure.

Reducing randomness in the distribution of teaching staff would make it possible to reduce class sizes for the majority of learners and improve promotion rates. In Mali, teachers are not only in short supply, they are also unevenly distributed between schools. For example, in basic cycle 1, 25 per cent of learners attend classes with fewer than 33 students, while another 25 per cent attend classes with more than 81 students.[18] With the degree of randomness[19] at 49 per cent in the public sector in basic cycle 1, Mali is among the African countries where the distribution of teachers is least linked to school size.[20]

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[16] Class size is calculated by dividing the number of learners in a given grade by the number of classes in that grade in the school. When children are part of a multigrade class, the number of learners in the class is higher, as the class includes learners from a different grade.

[17] The models in this analysis include class size and class size squared to capture non-linear effects.

[18] Statistics for 2018/19.

[19] The degree of randomness in teacher distribution represents the share of variance in the number of teachers per school that cannot be explained by the number of students per school. If school planners allocated teachers perfectly, so that pupil-teacher ratios were identical in every school in the country, the degree of randomness would be 0 per cent. Conversely, if teachers were allocated to schools regardless of the number of students attending the schools, the degree of randomness would be 100 per cent.

[20] See United Nations Educational, Scientific and Cultural Organization International Institute for Educational Planning Pôle de Dakar, 'Teacher Allocation and Utilization in Africa', working paper, IIPE, Dakar, May 2016, <https://unesdoc.unesco.org/ark:/48223/pf0000259340>, accessed 13 November 2023.

To estimate the potential benefits of reducing the randomness of teacher distribution, a simulation was run in which the pupil-teacher ratio could not exceed 70 per school in public schools.

This would mean reassigning around 2,100 teachers to schools where the pupil-teacher ratio is currently over 70. Doing this would cause the degree of randomness to fall to 12 per cent and promotion rates to increase by 0.9 percentage points.

Distributing teaching staff is a challenge not only in Mali, but also in many other African countries. UNICEF, in collaboration with the education ministries of several African countries, has launched research into how teacher distribution can improve learning.[21]

Figure 11: Class size and predicted promotion rates in basic cycles 1 and 2
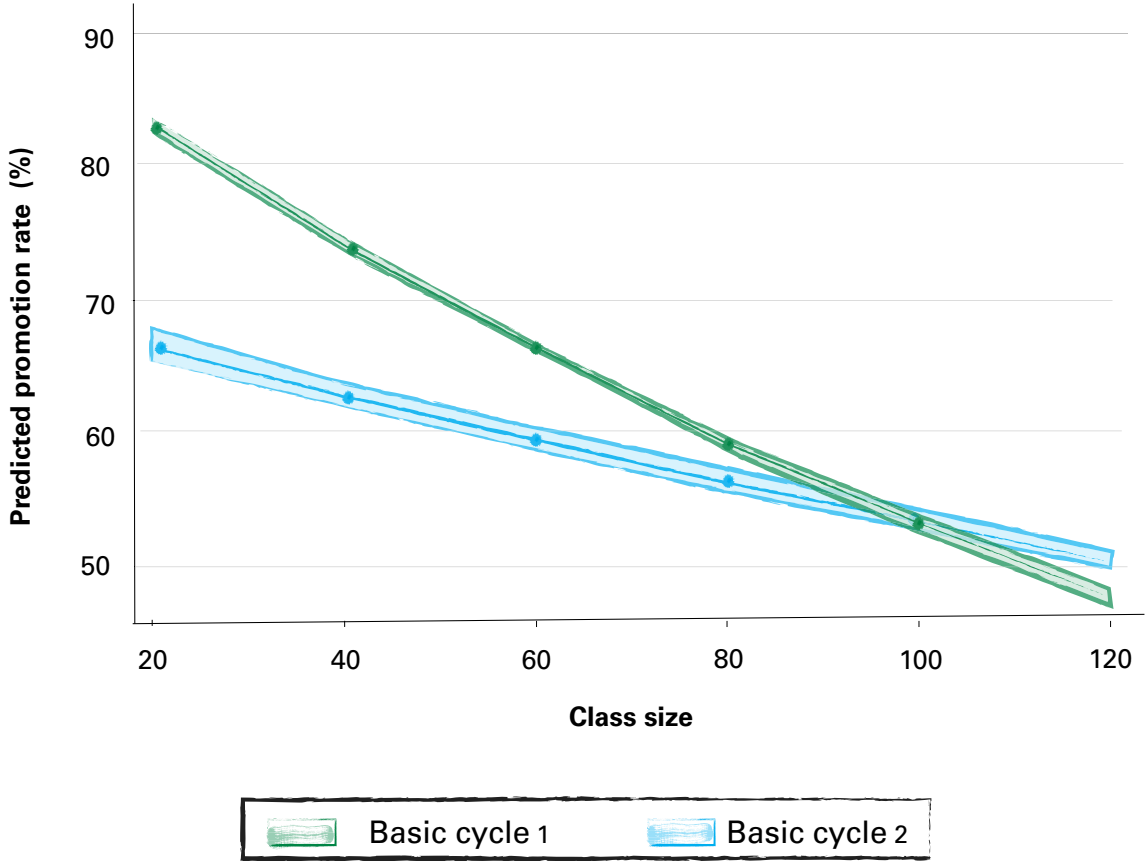
Source: Prepared by the authors using EMIS data from 2016–2017 to 2018–2019.

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21   See United Nations Children's Fund, 'Teachers for All: Improving teacher deployment in Africa', UNICEF, New York, <www.unicef-irc.org/research/teachers-for-all>, accessed 13 November 2023.

4.3 Teaching in national languages (curricular teaching)

In basic cycle 1, 15 per cent of learners benefit from curricular teaching, i.e. they are taught partly in Mali's national language. Curricular teaching is used in public schools (20.6 per cent) and community schools (19.9 per cent), but remains fairly rare in private schools (0.7 per cent) and madrasas (3.1 per cent). Many students do not speak French at home, so a bilingual teaching programme can facilitate learning and reduce academic failure in small classes.

The use of curricular teaching is associated with better outcomes (+1 percentage point in the promotion rate). This association is particularly strong in community schools (+2.3 percentage points), but is not statistically different from 0 in public schools. Similarly, the coefficient associated with curricular teaching is negative in urban areas (-0.8 percentage points, but only significant at 10 per cent), but positive in rural areas (+1.2 percentage points) and even stronger in remote rural areas (+1.9 percentage points). It is possible that learners in rural public schools or community schools benefit more from curricular teaching as the use and knowledge of French at home is lower. More widespread use of curricular teaching in these areas could help improve school results.

4.4 Community participation

The models show no association between the presence of a functional school management committee (captured by the existence of a school development project) or mothers' association and the promotion rate. As described earlier in the report, community participation in Mali involves the creation of a school management committee. Most schools have a committee (80 per cent overall, including 95.3 per cent in the public sector), but it is often not very functional. In addition, around a third of schools have a mothers' association. However, it should be noted that the models control for many factors that are, at least in part, the responsibility of the school management committee or mothers' association (availability of textbooks, latrines, canteen, etc.). Further analysis revealed that in basic cycles 1 and 2, the implementation of a school development project or the creation of a mothers' association were associated with a better school environment (better water and electricity supply and greater availability of latrines, textbooks or canteens), but not directly associated with better promotion rates.

The models also studied the effect of setting up a learning community, which two thirds of schools have. Their impact is unclear: there is a slightly positive association in rural areas in basic cycle 1, but a negative one in basic cycle 2. There is no clear evidence that these structures improve learner outcomes, although they may have indirect effects by improving the school environment and teacher standards.

4.5   School inputs and infrastructure

The models reveal a positive association between textbooks and promotion rates in both basic cycle 1 (+1.6 percentage points per textbook) and basic cycle 2 (+4 percentage points per textbook), with this association being stronger in urban areas. Textbook availability is also associated with a better DEF average grade in basic cycle 2 (+0.13 points per textbook), demonstrating the relationship between textbooks and learning. Textbook availability is calculated per learner and varies between 0 and 4 in basic cycle 1 and between 0 and 3 in basic cycle 2.[22] Only 1 textbook out of 4 is available in basic cycle 1, and 1.2 out of 3 in basic cycle 2. Taking into account the low rate of textbook ownership, if all learners had all required textbooks, the model results suggest that the promotion rate could increase by 4.5 points in basic cycle 1 and 7.2 points in basic cycle 2.

Textbooks are not only in short supply; they are also poorly distributed throughout schools. Thus, while 15.5 per cent of learners in public schools in basic cycle 1 have access to only 1 mathematics textbook (19.8 per cent for French textbooks) for every 10 learners, 21.2 per cent (20.1 per cent for French textbooks) have access to more than 1 textbook per learner. If the distribution of textbooks in the public sector were optimized so that the number of learners per textbook never exceeded 1, effective access to textbooks would rise from 1.3 to 1.9. According to this analysis, this could lead to a 1.1-point increase in the promotion rate. In light of these significant effects, and given that textbooks are relatively inexpensive, increasing the number of textbooks per student and distributing them better could be an effective way to improve the promotion rate.

The school's infrastructure also correlates with better promotion rates. The presence of a school canteen (11.8 per cent in basic cycle 1 and 7.9 per cent in basic cycle 2) is associated with a better promotion rate (+0.8 points). Dropout rates are also lower when the school has a canteen (-1.1 points in basic cycle 1). Furthermore, 79.1 per cent and 84.3 per cent of learners in basic cycles 1 and 2 respectively attend a school that has latrines. The latrine variable was assessed by learner gender; girls benefit from the presence of latrines (+0.6 points in the promotion rate) in basic cycle 1 while, interestingly, the coefficient is negative for boys (-0.9 points).

The presence of latrines helps reduce the dropout rate for girls (-0.7 points). The correlation between the presence of latrines and the promotion rate for girls is particularly marked in remote rural areas (+1.3 points in the promotion rate for girls), where many schools lack latrines (30 per cent of learners attend a school without a latrine in these regions). In basic cycle 2, the overall effect of latrines on girls and boys is negative or not significant. It is difficult to explain this result, and more research is needed on this subject.

The models also show that lack of space has harmful effects on learning. **Increasing the number of learners per classroom has a negative effect in basic cycles 1 (-0.5 points in the promotion rate for every 10 additional learners) and 2 (-1 point in the promotion rate for every 10 additional learners).** This correlation is found in all education systems, but is particularly marked in remote rural areas (-0.8 points and -1.6 points in the promotion rate per 10 additional learners in basic cycles 1 and 2 respectively). The construction of additional classrooms could help improve learners' academic performance.

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[22] In basic cycle 1, the textbooks taken into account are those for French, mathematics, Bambara and other subjects. In basic cycle 2, they are textbooks for French, mathematics and other subjects.

4.6　Zone and school characteristics[23]

Private schools have better promotion rates than public schools in basic cycle 1 (+4.6 points) and basic cycle 2 (+18.9 points). As the models control for school allocations, these differences may stem from the profile of the learners attending these schools, or from the management of these schools. It should also be noted that in basic cycle 1, public schools outperform community schools (+0.9 points) and madrasas (+1.3 points), but these differences are fairly small.

Unsurprisingly, there is strong correlation between school location and academic performance. **As such, urban areas are associated with promotion rates 5.2 points and 1.8 points higher in basic cycles 1 and 2 respectively, and promotion rates are lower when schools are located far from the centre or the CAP.** It is likely that these differences at least partly reflect the differences in public schools, but they also suggest that the Malian school system is unable to eliminate inequalities between learners from different backgrounds.

The results of the models show that older, larger schools that provide teaching for the entirety of basic cycle 1 achieve better results. Finally, access to better school infrastructure, such as permanent buildings and water and electricity supplies, is associated with higher promotion rates.

[23]　As the main models include school-level fixed effects, it is not possible to test variables that do not vary over time (e.g. school status, urban or rural location) or that vary only a little over time (e.g. electricity supply in the school). In order to test these parameters, the analysis estimated models for basic cycles 1 and 2, using fixed effects at the CAP level to analyse the promotion rate. Overall, these models produce results that are fairly close to the school-level fixed-effects models, which suggest that the results presented above are valid.

5. Discussion

Discussion

Analyses of EMIS and exam data in Mali have revealed a number of ideas that may help inform education policy.

A better understanding of gender dynamics in teacher-learner interactions and their effect on learner performance could help identify ways to improve teaching practices and enable both girls and boys to do better, regardless of their teacher's gender. With women making up less than one in three teachers in basic cycle 1 and less than one in six in basic cycle 2, girls are unlikely to have a female teacher. This seems to have a negative effect on them, especially in rural and remote areas where the number of female teachers is even lower, even though the results show that girls would benefit more from their presence. The fact that boys seem to benefit from the presence of male teachers suggests that gender issues are prevalent in the Malian school system. Although increasing the number of female teachers has a fairly positive effect on girls' performance in basic cycles 1 and 2, it may be accompanied by a larger drop in the promotion rate for boys in basic cycle 1, resulting in a slight decline in performance overall. In addition, recruiting a large number of female teachers could prove complicated. Experiences in several African countries have shown that assigning female teachers to rural areas is often difficult for cultural or security reasons. Thus, further

analysis and consideration of constraints relating to teacher recruitment will be necessary in order to formulate educational policy options in line with the gender dynamics at play in schools.

Strengthening EMIS data collection by including more information on teachers could enable more-in-depth analyses to be carried out in the coming years, and the effects of teacher recruitment reforms to be assessed. At present, the information in the database does not allow detailed exploration of the effects of teachers' training or academic level on learners' academic performance. In addition, analyses of exam results are limited and imprecise due to the lack of a common identifier for EMIS data and exam data. If a common identifier were created for DEF results and EMIS data, it would enable a more detailed analysis of the factors associated with better exam performance.

Investments need to be made to recruit more teachers and buy more textbooks, and resource management must also be improved to make the most of these investments. A shortage of teachers or textbooks is a factor in learners repeating years and dropping out. Besides the limited number of teachers and textbooks, the school system also suffers from suboptimal allocation of resources, which makes it less effective. Many schools also seem to require investment in infrastructure, such as latrines, canteens and new classrooms.

Finally, the results showed that investing in better schooling conditions for students can improve promotion rates and reduce dropout rates. In basic cycle 1, only 11.8 per cent of students have access to a canteen, even though their presence is associated with better promotion rates and lower dropout rates, and helps ensure better nutrition for students. Latrines are important to prevent girls dropping out of school, and a shortage of classrooms contributes to lower student performance, especially when schools are then forced to adopt a double-shift system. Therefore, although costly, investment in school infrastructure must continue and be stepped up.

The results are encouraging in terms of the positive effects of curricular teaching (use of national languages), but the practice is still not widespread enough. The positive effects seem to be mainly concentrated in rural areas, which perhaps means that these areas should be prioritized for the deployment of curricular teaching.

6. Conclusion

Conclusion

The first stage of the DMS research in Mali analysed performance factors of the Malian education system using data from EMIS and exams. Econometric modelling has revealed education policy insights that could improve school performance. Quantifying the relationships between school inputs and performance variables helps guide the Ministry of Education's educational policies and budget allocations.

Several interesting observations can be made about the results of the econometric models, such as the fact that girls perform better in the presence of female teachers, and that shortages and the poor distribution of teachers and textbooks are obstacles to student success. These findings can inform political decisions about how the Malian education system operates, and help guide educational policy. The results of this report have also highlighted the good results achieved by schools practising curricular teaching, which PRODEC 2 aims to extend, among other things. Finally, the results have underlined how important school infrastructure is for student success, with promotion rates higher and dropout rates lower in schools with canteens and latrines, or with fewer students per classroom.

However, it is also important to highlight the limitations of these analyses. i) Firstly, although contextual factors have been taken into account,[24] biases may remain and estimated relationships may be influenced by confounding factors not captured in the models. ii) Secondly, the analysis lacks information that could explain the phenomena observed. This limits the ability to use these results to guide education policy. For example, it can be observed that girls do better when their teachers are female, but it is impossible to confirm whether this is due to different teaching and behavioural practices used by male and female teachers or because girls identify more readily with female teachers and thus do better in school. In the first case, it is conceivable that girls' academic achievement could be improved by changing male teachers' practices, while in the second case only the recruitment of more women could have a positive effect on girls' performance. Finally, only a small portion of the variance in school performance is explained by the models. Indeed, many parameters related to teaching practices or school management are not captured by the data, even though they can have a significant influence on school performance.

The next stages of the DMS research in Mali will aim to address some of the limitations identified. Collecting additional qualitative data in positive deviant schools (i.e. schools that perform significantly better than the models predict, compared with control schools) should shed light on the behaviours and practices that the models do not take into account, but that may explain learners' results. In addition, analysis of these data should provide insight into the underlying reasons for some of the effects observed.

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[24] Mainly thanks to the inclusion of school-level fixed effects.

7. Appendices

Appendix 1: EMIS data production process and DEF results

This appendix describes in greater detail the data-collection process, the information contained in the databases, the limitations of this information and how the basis for the quantitative analysis is created.

Process of collecting data for the EMIS database

Every year, the Ministry produces statistical data to guide the education system. The whole process is initiated by an official decision signed off by the Minister, which is then sent to the teaching academies alongside an implementation timetable. Once the data-collection tools have been updated and stabilized by the planning and statistics unit for the education sector, they are sent to the teaching academies, who print them out according to the number of schools per cycle. These forms are then sent to the CAPs, secondary schools and conventional schools no later than two weeks into the school year. The CAPs in turn send them to the school head teachers as per the established timetable. The teaching academies then organize training sessions on how to fill in the questionnaires.

Once these have been completed, the head teachers return them to their supervisory pedagogical counsellor, and the guidance counsellor at each CAP checks and verifies the consistency of the data entered. It should be noted that the planning and statistics unit organizes quality control missions and checks the consistency of the data entered by all teaching academies.

Once the questionnaires have been completed and their physical consistency checked, the data for each teaching academy are entered on the StatEduc platform.[25] This process is supervised and supported by agents from the planning and statistics

unit and the central administrator of the examination and competitive examination planning division. Once the data have been entered, data entry agents and statistics officers from within the application carry out a second consistency check, in order to correct any data entry errors and inconsistencies that may have been detected. The data are then exported and sent to be compiled at the regional level.

The next stage is to validate the data at the regional level. To this end, a workshop bringing together the planning and statistics unit, teaching academies and CAPs is organized at the end of the data entry process to audit and validate the data entered in the StatEduc database. The data from each teaching academy are presented, checked and validated, then compiled for each region. After the regional workshops have been completed, the regional databases are compiled into a national database, which undergoes a final audit. Once the national database is available, a technical workshop bringing together statisticians, IT specialists, economists and planners from all of the Ministry's central and regional departments, as well as a statistician from the National Institute of Statistics, is organized to produce management tools, including the national directory. Finally, a national workshop to present the statistics for the school year is organized for all actors in the Malian education system (policymakers, planners, civil society, and technical and financial partners). The management tools are available in both hard-copy and digital versions.

Information collected in the EMIS database

Each year, the Ministry of Education merges the EMIS with data from previous years to create a relational database containing

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[25] EMIS data-collection software developed by the UNESCO Institute for Statistics and made available to the education ministries of several African countries, including Mali.

longitudinal data spanning several years. Currently, the EMIS contains information from 2016 to 2019.

This database is made up of hundreds of variables relating in particular to the following aspects:

1.	School identifier and location
2.	General information about the school
3.	Classroom characteristics and condition
4.	Classroom furniture
5.	Textbooks and school kits for basic cycles 1 and 2
6.	Teaching equipment
7.	New learners enrolled in first grade
8.	Information on staff (many variables not available)
9.	Breakdown of teaching groups and learners by grade
10.	Basic cycle 1 school catchment area
11.	Previous school of new entrants to seventh grade of basic cycle 2
12.	Observations.

Examination database (DEF)

At the end of the school year, head teachers draw up a list of candidates who will sit the end-of-year exams. This list serves as a basis for checking the lists entered at CAP level. Teaching academies use the resulting lists to assign seat numbers to candidates. After this phase, registration is generally not permitted. These final lists are used by the Centre national des examens et concours de l'education [National Centre for Testing and Competitive Examinations in Education] to label the DEF examination envelopes. Since 2017, the various teaching academies have implemented a SIG-Examen software package for exam preparation and management. In addition, the 97 CAPs (which often have limited connectivity) have installed and are using the 'lite' version of the SIG-Examen software package.

Examination data are made up of the results per year and per learner in each subject obtained in the DEF examination taken each year by students in grade 9 (basic cycle 2). These include the learner's school of origin, examination centre, gender, age, the number of times they have sat the exam, and their yearly average grade, subject grades, aggregate average grade and final result.

Since 2016, a team made up of agents from the National Centre for Testing and Competitive Examinations in Education and the Malian National Teaching Directorate has been carrying out descriptive analysis and interpretation of DEF results. The ensuing reports analysing the examination results are submitted to the national level, and recommendations are made for improving teaching and learning.

Possible data limitations and inaccuracies

EMIS data are collected via a well-established process with well-known verification and validation protocols. However, it should be noted that it is difficult to verify all data at source, and errors can creep in during the process. What's more, the data collected do not contain explanatory variables on the level of teacher training, the operation of community structures active within the schools, school attendance and actual learning time. The DEF database does not contain a school code, making it difficult to merge data at the school level.

Process of merging database information and creating the basis for analysis

The EMIS database contains information on 11,949 basic cycle 1 schools and 4,101 basic cycle 2 schools. In basic cycle 1, there are 5,729 public schools, 2,004 private schools, 2,154 community schools and 2,072 madrasas, while in basic cycle 2, there are 2,079 public schools, 1,315 private schools, 60 community schools and 647 madrasas. The data cover the period from the 2015/16 school year to the 2018/19 school year. A unique school code links information for each school over time.

For basic cycles 1 and 2, enrolment information is collected by grade, gender and age. In addition, for each grade in basic cycle 1, the merged database contains information on the distribution of teaching groups by type of teaching (classic, curriculum) and by type of operation (single, double-shift, multiple grades in one class). However, data on teachers are collected by type of qualification. This means it is possible to associate teacher information with the relevant school, but not with the grade they teach. Enrolment data are systematically disaggregated by gender, allowing for separate studies of girls and boys. To keep the level of analysis as precise as possible, the DMS team has linked the EMIS data to build a database for each cycle, in which the unit of observation is a gender-disaggregated grade in a given school for a school year.[26] In most cases,[27] there is only one teaching group per grade, but where there is more than one teaching group per grade in a school, the data for the groups are aggregated. The final database for basic cycle 1 schools contains 161,536 observations, and that for basic cycle 2 contains 31,560 observations.

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[26] For example: characteristics of girls in first grade in school X for the 2015/16 school year.
[27] In total, 98.2 per cent of teaching grades have only one teaching group.

Appendix 2: Descriptive statistics

Table 1: Descriptive statistics in basic cycle 1

VARIABLES	National	Urban	Rural	Remote rural	Public	Private	Community	Madrasa	Boys	Girls
Promotion rate (%)	73.2	79.5	72.2	67.5	70.9	85.8	71.4	70.3	72.9	73.5
Repetition rate (%)	15	12.1	16.5	16.3	18.9	6	10.5	11.4	15.5	14.4
Dropout rate (%)	11.8	8.4	11.3	16.2	10.2	8.2	18.1	18.4	11.5	12.1
Girls (%)	46.4	49	46.4	43.3	46.1	47.8	43.4	47.8	0	100
Average age	8.8	8.7	8.8	8.8	9	8.2	8.5	8.7	8.8	8.8
Female teachers (%)	32.1	45.4	30.8	18.7	34.8	35.2	27.3	19.7	31.3	33
Teachers who are civil servants (%)	43.3	39.4	46.5	43.3	65.3	4.5	16.6	8.1	43.3	43.3
Teachers on contracts (%)	54.1	58.5	50.7	53.8	31.3	94.4	81.9	90.2	54.2	54.1
Trainee teachers (%)	2.6	2.1	2.8	2.9	3.4	1.1	1.5	1.6	2.6	2.6
Teachers with a DEF or higher (%)	88.2	91.4	88.1	84.8	88.6	93.5	88.1	80.8	88.1	88.4
SARPE teachers (%)	16.7	18	16.3	15.9	19.9	15.2	13.2	6.6	16.7	16.7
Class size	63.6	74.5	61.1	54.6	72	44.8	38.5	64.2	62.6	64.7
Multigrade class (%)	14.1	2.3	15.3	25.7	14.1	1.7	31.8	16.1	14.8	13.2
Double-shift system (%)	3.6	5.9	2.9	2.2	5.3	0.1	2.7	1	3.6	3.7
Curricular teaching (%)	15	12.5	17.4	14.8	20.6	0.7	19.9	3.1	15.2	14.8
Textbooks (maximum 4)	1	0.7	1.1	1.2	1.3	0.5	1.2	0.1	1	1
Female head teacher (%)	11.2	20.1	8.3	5	13.1	12.2	10	2.4	10.8	11.7
School development project (%)	50.1	48.5	52.4	49	59.3	36.9	48.5	25.3	49.8	50.4
Presence of a mothers' association (%)	35.8	26.9	42.5	37.1	45.5	12.2	32.4	22.3	35.7	36.1
Presence of a learning community (%)	66.5	65.1	69.6	64	83.9	36.5	58.5	29.3	66.5	66.5
Presence of latrines (%)	79.4	89	78.3	70	82	92.5	58.6	67.2	78.9	80
Students per classroom	64.6	72.3	63	57.8	75.2	40.5	43.7	58.8	63.9	65.4
Presence of a canteen (%)	11.8	9	12	14.9	14.5	10.1	10.7	3	11.6	12.1
Distance to CAP (km)	28.6	4.1	16.1	72.7	31.3	7.3	45.8	29.2	30	27
Bambara (%)	71.6	90.3	69.7	52.9	65.3	96.5	71.4	71.3	70.9	72.3
Years since opening	22.9	21.2	22.9	24.9	27.5	12.4	15.5	19.4	22.9	22.9
Annual enrolment[28] (%)	91.1	99.1	90.1	83.4	91.3	99.4	69.2	95.4	90.8	91.5

VARIABLES	National	Urban	Rural	Remote rural	Public	Private	Community	Madrasa	Boys	Girls
All grades available (%)	21.5	36.7	15.7	12.2	9.4	60	10.3	38.8	21	22.1
School size	363.5	474.1	333.7	278	408.2	302.4	190	351.3	357.2	370.7
Solid walls (%)	87.8	91.2	86.4	85.9	86.8	94.8	83.1	87.4	87.8	87.8
Water supply (%)	66.7	83.7	63.4	51.8	69.2	82.6	40.2	55.2	65.7	67.8
Electricity supply (%)	24.2	55.2	12.3	5	16	65.4	10.2	23	23.1	25.4
Share of population (%)	**100**	**32.6**	**38.4**	**29**	**61.1**	**15.7**	**9.2**	**14**	**53.6**	**46.4**

Table 2: Descriptive statistics in basic cycle 2

VARIABLES	National	Urban	Rural	Remote rural	Public	Private	Community	Madrasa	Boys	Girls
Promotion rate (%)	64.2	69.2	62.1	57.2	57.7	88.1	77.9	71.7	64.2	64.2
Repetition rate (%)	21.2	18.9	23.1	22.7	25.5	7.1	12.4	12.6	21.3	21.1
Dropout rate (%)	14.6	11.9	14.8	20.2	16.8	4.8	9.7	15.6	14.5	14.7
DEF average grade	8.9	9.2	8.7	8.6	8.6	10	9.3	8.5	9	8.8
Girls (%)	47	50.3	46	41.5	46.9	48.8	46.9	43.2	0	100
Average age	13	12.9	13.1	13.2	13.1	12.7	13.2	13.3	13.1	13
Female teachers (%)	15.5	21.2	13.6	6.7	18	9.4	9.9	4.7	14.7	16.4
Teachers who are civil servants (%)	58.2	47.3	65	69.4	75.4	7	14.8	8.8	58.5	57.8
Teachers on contracts (%)	35.5	48.7	28.1	20.5	16.7	91.2	83.7	89.3	35.2	35.9
Trainee teachers (%)	6.3	4	6.9	10	7.8	1.8	1.6	1.9	6.3	6.3
Class size	81.8	82.6	81.7	80.4	94.2	43.3	66.8	49.5	79	85
Textbooks (maximum 4)	1.2	1.1	1.3	1.4	1.4	0.8	0.6	0.5	1.3	1.2
Female head teacher (%)	7	10.1	5.9	2.4	7.3	7.8	18.2	0.7	6.6	7.5
School development project (%)	42.2	38	42.1	51.7	44.9	34.5	52.5	31.6	41.9	42.6
Presence of a mothers' association (%)	25.2	18	31	30.2	28.5	11	16.8	26.5	25.2	25.2
Presence of a learning community (%)	19.5	23.4	18	13.7	14.8	31.9	32	35.4	19.3	19.6
Presence of latrines (%)	84.3	88.7	82.1	78.9	82.6	93.3	82.5	80.2	84.2	84.5
Students per classroom	68.4	70.1	69	63.8	77.7	39.6	47.4	46.6	66.9	70.2

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[28]   The school enrolls new learners every year.

VARIABLES	National	Urban	Rural	Remote rural	Public	Private	Community	Madrasa	Boys	Girls
Presence of a canteen (%)	7.9	10	5.8	7.1	6.5	14.3	13	5.9	8	7.8
Distance to CAP (km)	20.5	3.5	14.2	68.8	24.3	6.8	17.2	15	22.5	18.3
Bambara (%)	80.1	92.8	76.9	59.1	75.7	96.8	94.6	84.3	78.7	81.7
Years since opening	17.8	19.2	16.1	17.6	18.7	12.9	11	21.5	17.8	17.9
Annual enrolment (%)	99	99.3	99.2	98.1	98.9	99.6	100	98.8	99	99
All grades available (%)	26.9	39.4	19.5	13.4	7.6	86	53.7	79	26.8	27
School size	290.3	332.9	270.8	232.3	331.6	166.8	211.6	172.8	282	299.8
Solid walls (%)	91.9	92.7	90	93.5	90.8	96.1	95.7	92.9	91.9	92
Water supply (%)	72.3	85.4	64.1	59.4	68.6	87	58.5	76.1	71.7	72.9
Electricity supply (%)	34.4	59.3	19.6	8	23.6	76.3	35.1	44.3	33.3	35.7
Share of population (%)	**100**	**43.3**	**36.6**	**20.1**	**74.5**	**17.4**	**0.8**	**7.3**	**53**	**47**

Appendix 3: Econometric models

Table 3: Factors associated with learner performance in basic cycle 1

VARIABLES	(1) Promotion rate	(2) Repetition rate	(3) Dropout rate	(4) Promotion rate
Girls	- 2.861***	0.00563	2.856***	- 2.871***
Average age of learners	- 0.483***	- 0.0140	0.497***	- 0.961***
Female teachers (share)[29]	- 3.034***	1.048***	1.986***	- 0.0217
Female students and female teachers	5.258***	- 2.080***	- 3.179***	5.168***
Baseline: Civil servants				
Teachers on contracts (share)	- 0.119	- 0.158	0.277	- 0.840***
Trainee teachers (share)	5.487***	- 1.923***	- 3.564***	3.232***
Teachers with a DEF or higher (share)	0.494	0.772***	- 1.266***	0.498*

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[29]   In the models, the share of female teachers, teachers on contracts, trainee teachers, teachers with a DEF and SARPE teachers is expressed on a scale from 0 to 1, and the coefficients should be interpreted as the change from no teachers in the school having this characteristic to all teachers in the school having this characteristic.

VARIABLES	(1) Promotion rate	(2) Repetition rate	(3) Dropout rate	(4) Promotion rate
SARPE teachers (share)	0.582**	- 1.232***	0.650**	0.637***
Class size	- 0.503***	0.0736***	0.430***	- 0.307***
Class size squared	0.00106***	- 0.000210***	- 0.000852***	0.000448***
Multigrade class	- 1.151***	0.141	1.010***	- 3.315***
Double-shift system	- 6.462***	0.769***	5.693***	- 5.788***
Curricular teaching	1.020***	- 2.191***	1.171***	1.616***
Textbooks per learner (maximum 4)	1.569***	- 0.338***	- 1.232***	0.628***
Female head teacher	- 0.191	0.580**	- 0.389	0.306
Female head teacher and female students	0.721**	- 0.419**	- 0.303	0.654*
School development project	- 0.325	- 0.186	0.510***	- 0.153
Presence of a mothers' association	- 0.171	- 0.0718	0.243	0.0352
Presence of a learning community	0.277	0.162	- 0.439**	0.953***
Presence of latrines	- 0.901***	0.442***	0.460*	- 0.232
Female students and latrines	1.536***	- 0.379**	- 1.157***	1.499***
Students per classroom	- 0.0456***	- 0.0287***	0.0742***	0.0178***
Presence of a canteen	0.826**	0.277	- 1.103***	0.122
Baseline: Grade 1				
Grade 2	- 0.715***	2.368***	- 1.653***	1.213***
Grade 3	- 7.321***	8.148***	- 0.827***	- 4.645***
Grade 4	- 11.73***	9.629***	2.103***	- 7.892***
Grade 5	- 16.79***	11.48***	5.301***	- 11.98***
Grade 6	- 21.64***	10.34***	11.30***	- 15.43***
Baseline: Year 2015/16				
Year = 16/17	0.512***	- 0.447***	- 0.0650	0.385**
Year = 17/18	- 1.546***	1.544***	0.00160	- 1.996***
Year = 18/19	1.001***	- 0.544***	- 0.457***	0.292*
Baseline: Public school				
Private school				4.638***
Community school				- 0.865***
Madrasa				- 1.315***
Urban area				5.150***
Distance to CAP				- 0.0283***
Language in area: Bambara				0.894***

VARIABLES	(1) Promotion rate	(2) Repetition rate	(3) Dropout rate	(4) Promotion rate
Years since opening				0.0391***
Annual enrolment				2.771***
All grades available				
School size				0.0212***
Solid walls (share)				0.466**
Water supply				0.596***
Electricity supply				1.990***
Constant	**112.8*** **	**8.073*** **	**- 20.84*** **	**81.65*** **
Observations	**338,295**	**338,295**	**338,295**	**337,759**
R-squared	**0.303**	**0.351**	**0.225**	**0.155**

Robust standard errors are shown in brackets.
*** p<0.01; ** p<0.05; * p<0.1.
Models (1), (2) and (3) include school-level fixed effects.
Model (4) includes CAP-level fixed effects.

Table 4: Factors associated with the promotion rate of primary school learners by school status in basic cycle 1

VARIABLES	(1) Public	(2) Private	(3) Community	(4) Madrasa
Girls	- 2.184***	1.245	- 4.120***	- 4.333***
Average age of learners	- 0.441***	- 0.355***	- 0.0779	- 0.703***
Female teachers (share)	- 3.604***	0.504	0.116	- 5.684***
Female students and female teachers	5.358***	1.017	4.982***	6.241***
Baseline: Civil servants				
Teachers on contracts (share)	- 0.161	1.036	- 1.567	- 0.514
Trainee teachers (share)	6.179***	10.07***	- 0.253	3.187
Teachers with a DEF or higher (share)	0.559	0.433	2.390***	- 0.664
SARPE teachers (share)	0.810**	1.454**	- 0.0241	- 2.286**
Class size	- 0.444***	- 0.636***	- 0.854***	- 0.651***
Class size squared	0.000860***	0.00200***	0.00260***	0.00154***

VARIABLES	(1) Public	(2) Private	(3) Community	(4) Madrasa
Multigrade class	- 1.549***	- 1.702	- 0.112	- 0.340
Double-shift system	- 6.676***	- 10.94**	- 3.508**	- 2.290
Curricular teaching	- 0.0457	3.178*	2.267***	2.550*
Textbooks per learner (maximum 4)	1.730***	0.721**	0.451*	3.576***
Female head teacher	- 1.211**	1.571*	2.861**	- 0.0689
Female head teacher and female students	0.747	0.0949	- 0.936	3.732**
School development project	- 0.258	- 1.220***	- 0.645	0.766
Presence of a mothers' association	- 0.359	1.481**	- 0.163	- 0.0955
Presence of a learning community	0.507*	- 0.132	0.160	- 0.401
Presence of latrines	- 0.0944	- 1.754**	- 1.572**	- 1.121*
Female students and latrines	0.924**	- 0.252	1.760***	1.505**
Students per classroom	- 0.0375***	- 0.0377***	- 0.0576***	- 0.0663***
Presence of a canteen	1.282***	- 0.767	- 0.235	- 0.415
Baseline: Grade 1				
Grade 2	- 1.665***	2.046***	- 1.105**	- 1.302**
Grade 3	- 8.931***	- 3.425***	- 7.793***	- 7.600***
Grade 4	- 13.99***	- 5.023***	- 12.04***	- 13.18***
Grade 5	- 19.69***	- 5.699***	- 20.30***	- 19.03***
Grade 6	- 22.70***	- 18.20***	- 30.13***	- 22.78***
Baseline: Year 2015/16				
Year = 16/17	0.220	1.202***	- 0.349	2.383***
Year = 17/18	- 2.589***	1.342***	- 2.541***	1.505***
Year = 18/19	0.496**	2.451***	1.074**	3.141***
Constant	111.3***	113.7***	109.2***	119.8***
Observations	187,194	57,231	47,400	46,470
R-squared	0.293	0.241	0.300	0.302

Notes: Robust standard errors are shown in brackets.
*** p<0.01; ** p<0.05; * p<0.1.
The models include school-level fixed effects.

Table 5: Factors associated with the promotion rate of primary school learners by place of residence in basic cycle 1

VARIABLES	(1) Urban area	(2) Rural area	(3) Remote rural area
Girls	1.123	- 2.020***	- 4.383***
Average age of learners	- 0.356***	- 0.567***	- 0.395***
Female teachers (share)	- 0.902	- 4.112***	- 1.299
Female students and female teachers	2.488***	4.627***	4.046***
Baseline: Civil servants			
Teachers on contracts (share)	0.656	- 0.910*	0.0399
Trainee teachers (share)	1.562	3.508***	9.388***
Teachers with a DEF or higher (share)	- 0.991	0.844	0.942*
SARPE teachers (share)	0.304	0.782*	0.892*
Class size	- 0.438***	- 0.515***	- 0.589***
Class size squared	0.000955***	0.00102***	0.00123***
Multigrade class	- 1.519	- 1.737***	- 0.657**
Double-shift system	- 6.559***	- 8.022***	- 3.675***
Curricular teaching	- 0.789*	1.152***	1.876***
Textbooks per learner (maximum 4)	2.611***	1.328***	0.975***
Female head teacher	- 0.0798	- 0.00844	- 0.367
Female head teacher and female students	0.206	0.435	0.844
School development project	- 0.539	- 0.684**	0.493
Presence of a mothers' association	- 0.0306	- 0.544	0.393
Presence of a learning community	0.405	0.942***	- 0.932***
Presence of latrines	- 0.235	- 0.878**	- 0.779*
Female students and latrines	- 0.168	0.788**	2.088***
Students per classroom	- 0.0210***	- 0.0624***	- 0.0827***
Presence of a canteen	0.998	0.606	0.726
Baseline: Grade 1			
Grade 2	0.249	- 1.036***	- 1.634***
Grade 3	- 4.835***	- 8.197***	- 9.360***
Grade 4	- 8.329***	- 13.57***	- 13.86***
Grade 5	- 10.92***	- 19.14***	- 21.82***

VARIABLES	(1) Urban area	(2) Rural area	(3) Remote rural area
Grade 6	- 16.84***	- 24.48***	- 26.27***
Baseline: Year 2015/16			
Year = 16/17	0.572*	0.539**	0.666**
Year = 17/18	- 1.747***	- 0.859***	- 2.248***
Year = 18/19	0.551*	1.372***	1.147***
Constant	112.8***	115.1***	109.9***
Observations	86,255	135,296	116,649
R-squared	0.251	0.304	0.304

Notes: Robust standard errors are shown in brackets.
*** p<0.01; ** p<0.05; * p<0.1.
The models include school-level fixed effects.
Remote rural areas are defined as being more than 35 km from the CAP.

Table 6: Factors associated with learner performance in basic cycle 2

VARIABLES	(1) Promotion rate	(2) Repetition rate	(3) Dropout rate	(4) Promotion rate	(5) DEF average grade
Girls	80.1	92.8	76.9	59.1	75.7
Average age of learners	17.8	19.2	16.1	17.6	18.7
Female teachers (share)	99	99.3	99.2	98.1	98.9
Female students and female teachers	26.9	39.4	19.5	13.4	7.6
Baseline: Civil servants					
Teachers on contracts (share)	91.9	92.7	90	93.5	90.8
Trainee teachers (share)	72.3	85.4	64.1	59.4	68.6
Teachers with a DEF or higher (share)	34.4	59.3	19.6	8	23.6
SARPE teachers (share)	100	43.3	36.6	20.1	74.5
Class size	- 0.197***	0.0266***	0.171***	- 0.142***	- 0.00202
Class size squared	0.000269***	- 6.69e-05***	- 0.000202***	0.000115***	5.11e-06
Textbooks per learner (maximum 3)	4.039***	- 0.130	- 3.909***	0.314*	0.130**
Female head teacher	- 1.503	0.589	0.914	- 0.582	- 0.248
Female head teacher and female students	1.264	- 0.114	- 1.149	1.162	0.0610

VARIABLES	(1) Promotion rate	(2) Repetition rate	(3) Dropout rate	(4) Promotion rate	(5) DEF average grade
School development project	- 0.592	- 0.169	0.761	0.161	0.0311
Presence of a mothers' association	0.967	- 1.266***	0.299	1.904***	- 0.0403
Presence of a learning community	- 0.530	1.645***	- 1.115*	0.450	0.131
Presence of latrines	- 2.238***	0.311	1.928**	- 0.638	- 0.0442
Female students and latrines	1.050	- 0.283	- 0.767	0.911	0.171**
Students per classroom	- 0.109***	- 0.0411***	0.150***	0.0231**	- 0.000976
Presence of a canteen	- 0.325	- 0.0829	0.408	0.793	0.146
Baseline: Grade 7					
Grade = 8	9.903***	- 4.360***	- 5.543***	12.16***	
Baseline: Year 2015/16					
Year = 16/17	1.729***	- 0.596*	- 1.133**	1.663***	
Year = 17/18	1.034**	0.755**	- 1.789***	0.758	
Year = 18/19	2.618***	- 1.813***	- 0.805*	0.922	- 1.413***
Baseline: Public school					
Private school				18.69***	
Community school				15.84***	
Madrasa				8.704***	
Urban area				1.801**	
Distance to CAP				- 0.0261***	
Language in area: Bambara				2.745***	
Years since opening				0.0158	
Annual enrolment				- 0.546	
All grades available				1.870***	
School size				- 0.00131	
Solid walls (share)				0.871	
Water supply				- 0.342	
Electricity supply				2.154***	
Constant	**79.00***	**27.70***	**- 6.703***	**66.38***	**10.46***
Observations	**42,554**	**42,554**	**42,554**	**42,469**	**10,746**
R-squared	**0.469**	**0.420**	**0.298**	**0.257**	**0.763**

Table 7: Factors associated with the promotion rate of primary school learners by school status in basic cycle 2

VARIABLES	(1) Public	(2) Private	(3) Community	(4) Madrasa
Girls	- 4.691***	1.041	- 2.143	- 8.288***
Average age of learners	- 0.216	- 0.357	0.485	- 1.309***
Female teachers (share)	- 6.312**	- 2.787	23.82	11.05
Female students and female teachers	13.44***	- 1.644	- 13.74	13.50
Baseline: Civil servants				
Teachers on contracts (share)	- 0.315	1.817	- 12.63	7.529**
Trainee teachers (share)	7.345***	7.483	- 18.26	- 3.972
Class size	- 0.167***	- 0.668***	- 1.083***	- 0.486***
Class size squared	0.000228***	0.00241***	0.00450***	0.000729**
Textbooks per learner (maximum 3)	4.363***	2.092***	- 1.124	3.796***
Female head teacher	- 1.437	- 0.690	17.42*	14.16**
Female head teacher and female students	0.560	1.598	6.251	- 4.337
School development project	- 0.617	- 0.124	- 2.057	0.542
Presence of a mothers' association	1.234**	- 1.880	7.984	1.159
Presence of a learning community	- 1.606**	1.977*	4.288	3.490
Presence of latrines	- 1.481*	- 0.458	- 7.566	- 4.967*
Female students and latrines	0.358	0.723	7.923	- 0.252
Students per classroom	- 0.122***	- 0.0248	- 0.295	- 0.0580
Presence of a canteen	- 0.628	1.062	- 2.548	- 1.927
Baseline: Grade 7				
Grade 8	11.43***	5.386***	6.778**	4.770***
Baseline: Year 2015/16				
Year = 16/17	1.681***	1.403	4.232	2.245
Year = 17/18	0.347	3.677***	3.481	2.571
Year = 18/19	2.200***	4.998***	- 0.475	3.994**
Constant	**72.19*****	**104.7*****	**128.8*****	**105.5*****
Observations	**24,919**	**12,035**	**530**	**5,070**
R-squared	**0.407**	**0.376**	**0.363**	**0.355**

Table 8: Factors associated with the promotion rate of primary school learners by place of residence in basic cycle 2

VARIABLES	(1) Urban area	(2) Rural area	(3) Remote rural area
Girls	- 0.511	- 4.597***	- 5.884***
Average age of learners	- 0.936***	0.278	0.0144
Female teachers (share)	- 0.233	- 4.186	- 0.825
Female students and female teachers	3.814	10.48***	9.708*
Baseline: Civil servants			
Teachers on contracts (share)	- 1.075	2.300*	- 2.101
Trainee teachers (share)	- 5.414	10.45***	7.829***
Class size	- 0.277***	- 0.199***	- 0.202***
Class size squared	0.000477***	0.000365***	0.000261***
Textbooks per learner (maximum 4)	4.412***	4.360***	2.858***
Female head teacher	- 0.512	- 5.444**	11.90**
Female head teacher and female students	0.554	0.949	7.483
School development project	- 0.705	0.409	- 1.983**
Presence of a mothers' association	1.307	1.020	0.631
Presence of a learning community	1.521*	- 2.500**	- 2.997**
Presence of latrines	- 2.127*	- 1.967*	- 0.541
Female students and latrines	0.672	0.373	- 0.437
Students per classroom	- 0.0718***	- 0.122***	- 0.160***
Presence of a canteen	- 1.137	- 0.404	0.493
Baseline: Grade 7			
Grade 8	9.591***	10.85***	8.449***
Baseline: Year 2015/16			
Year = 16/17	2.681***	0.894	1.290
Year = 17/18	2.701***	0.718	- 1.205
Year = 18/19	4.983***	2.543***	- 1.655*
Constant	**91.70***	**68.44***	**76.51***
Observations	**17,468**	**15,445**	**9,614**
R-squared	**0.493**	**0.459**	**0.411**

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