Madagascar

DATA MUST SPEAK

Unpacking Factors
Influencing School Performance

UNICEF Innocenti – Global Office of Research and Foresight

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Acknowledgements

Data Must Speak research donor coalition:

Contents

Executive summary

Improving access to quality education for all school-age children is a priority for the Government of Madagascar. The Education Sector Plan 2018–2022 sets ambitious goals to achieve this, but significant challenges remain if school learning and retention are to be improved.

The research component of the DMS initiative aims to support the Government's goals of improving student learning and retention by examining the practices and behaviours of positive deviant schools (i.e., those that outperform other schools operating in similar contexts with equivalent resources) and identifying levers for scaling up these practices and behaviours in the nation's poorest-performing schools.

This report presents the results of the first stage in the research, which identifies various factors influencing educational outcomes in Madagascar and associated policy recommendations for improving student learning.[1] These analyses are based on administrative databases populated by the Ministry of Education, and cover all public primary schools in Madagascar.

Key conclusions and recommendations

Canteens in schools are associated with higher promotion rates between classes and higher pass rates for the certificat d'études primaires et élémentaires [Certificate of Primary Education – CEPE], but only 6 per cent of schools in Madagascar have one. Putting canteens in the schools that need them most could have a positive impact on student outcomes. It is also important to study the mechanisms associated with canteens in schools that enable students to be more successful.

Mixed-level classes are associated with lower promotion rates and lower CEPE pass rates. While the reasons behind these negative correlations are potentially numerous and need to be investigated further (reduced teaching time, different learning conditions, sharing of teaching time across year groups and so on), reducing the number of mixed-level classes where possible could be beneficial for students.

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1. The two types of academic outcome considered are student promotion rates from one year group to the next and CEPE scores.

A 20 per cent increase in the number of students who attended preschool is associated with an increase in promotion rates of over one percentage point. This is consistent with numerous studies showing the positive effects of preschool education. By 2020/21, approximately 24 per cent of primary school students had attended preschool, compared with 12 per cent in 2017/18. It is therefore essential to continue the efforts undertaken by the Ministry of Education to increase preschool education provision.

Schools with female head teachers and female teaching staff perform better on average. It is therefore important to better understand the practices and behaviours adopted by women that may account for these differences.[2] **Schools whose head teachers and teachers have bachelor's degrees also perform better on average.**
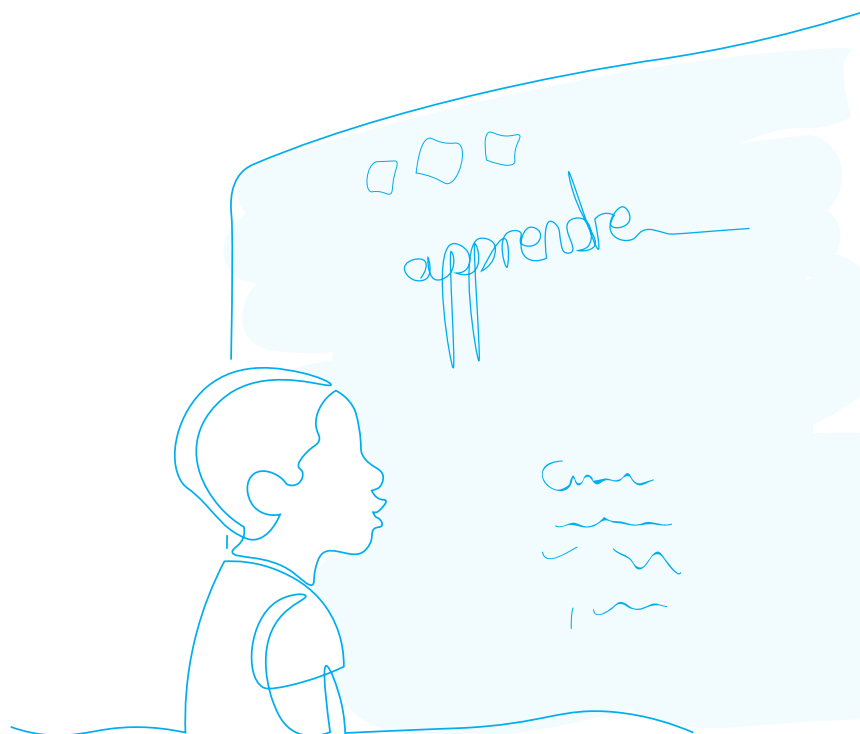
2. See the Women in Learning Leadership: Women's School Management and Leadership Practices research programme conducted by UNICEF Innocenti – Global Office of Research and Foresight and the Dakar Office of the United Nations Educational, Scientific and Cultural Organization (UNESCO) International Institute for Educational Planning.

1. Introduction

Introduction: DMS research in Madagascar

In 2014, Madagascar joined the DMS initiative, which aims to improve the equity and quality of education through enhanced use of education data. The initiative had two components in Madagascar: a technical assistance component focused on producing and disseminating school report cards, and a research component.[3] Launched in 2022, the purpose of the research component is to implement methodologies to identify positive deviant schools and disseminate their practices. This research studies the most successful schools by comparing them with other schools operating in similar contexts and with equivalent resources, and analyses their practices and behaviours. This allows practical recommendations to be put forward on how to encourage and scale up these practices and behaviours in the country's poorest-performing schools. The research thus aims to find local solutions to improve the quality of education in Madagascar.

This research component is structured around five key stages, presented in **Figure 1**.

This report details the first stage of the research and presents a quantitative analysis based on administrative data from Madagascar, which enables the various factors influencing educational outcomes in the country to be identified. The various stages of the research are described in more detail in **Appendix A**.

In Madagascar, the DMS initiative was implemented jointly by UNICEF Innocenti, the Ministry of Education and the UNICEF Madagascar country office. To make the DMS research as relevant as possible, the various activities carried out as part of the initiative are based on a participatory process. A national advisory team was set up to guide the research and provide strategic direction. In parallel, the Ministry of Education appointed a technical team of experts to jointly implement the research process and to prepare and analyse administrative data. The first stage of the research was initiated with the technical team at collaborative sessions during which important decisions about administrative data processing and research methodology were made.

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3. The report cards are produced using school data featuring key information for schools, local education administration districts (ZAPs in French) and school district authorities (CISCOs in French). They offer the various stakeholders insights into the management and planning of the education system.

Figure 1: DMS research stages

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
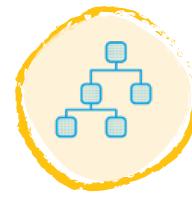
Stage 4

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

Stage 5

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

2. The Malagasy education system: current challenges and reforms

The Malagasy education system: current challenges and reforms

1. Organization of the Malagasy education system

Three ministries are responsible for education in Madagascar: the Ministry of Education, the Ministry of Higher Education and Scientific Research, and the Ministry of Employment, Technical Education and Vocational Training. Education is compulsory from the age of 6 and basic education, which includes primary and lower secondary school, lasts nine years. The private education system coexists alongside the public system, serving just under 20 per cent of all primary school students in 2020/21, according to the Ministry of Education.

The education system (see **Table 1**) is organized as follows:

Preschool education: for children aged between 3 and 5, aims to offer early learning and prepare them for primary school. While enrolment in preschool education is still limited and mostly concerns private schools, the Ministry of Education began setting up preschool classes in public primary school in 2010, resulting in a significant increase in enrolment in recent years.[4]

Primary education: lasts a total of five years, including two preparatory years (CP1 or Taona 1 [T1] and CP2 or Taona 2 [T2]); one elementary year (CE or Taona 3 [T3]); and two middle years (CM1 or Taona 4 [T4] and CM2 or Taona 5 [T5]).

Secondary education:

- **Lower secondary school (collège)** lasts four years and covers years 6, 7, 8 and 9 (6e, 5e, 4e and 3e). Access to lower secondary school (collège) is based on passing the CEPE and an additional selection process based on the results of the competitive examination for entry to grade 6.

- **Upper secondary school (lycée)** lasts three years and comprises years 10, 11 and 12 (2de, 1re and Terminale). Students can enrol in upper secondary education after obtaining the brevet d'étude du premier cycle [Lower Secondary Completion Certificate – BEPC] and undergoing a selection process.

Higher education: includes technical and vocational education (accessible after lower secondary school) and other higher education institutions. Provision is limited and unevenly distributed across the country.

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4. According to the United Nations, the preschool enrolment rate for children aged 3–5 years in public schools increased from 7.5 per cent in 2004/05 to 30 per cent in 2017/18.

Table 1: Organization of the Malagasy education system

	Description	Year groups
Preschool education	Early learning and preparation for primary school	
Primary education	Primary (five years)	T1, T2, T3, T4, T5
Secondary education	Lower secondary (four years) Upper secondary (three years)	Years 6, 7, 8 and 9 Years 10, 11 and 12
Higher education	Includes technical and vocational education	

2. Current challenges and reforms

In Madagascar, education is one of the Government's priorities under the National Development Plan and is also part of the Initiative for the Emergence of Madagascar, launched in 2018. The Education Sector Plan 2018–2022 sets ambitious goals for improving access to quality education for all school-age children.[5] These include: (i) gradually expanding preschool education; (ii) establishing a new structure for nine-year basic education; (iii) improving general secondary education; (iv) reducing the illiteracy rate; (v) promoting inclusive education; (vi) promoting citizenship and civic responsibility; and (vii) improving school management and governance.

Nevertheless, substantial challenges remain. According to the 'Global Education Policy Dashboard' (2021),[6] only 3.8 per cent of students in the fourth year of primary school participating in the assessments achieve 80 per cent of the minimum required reading, writing and mathematics skills. The COVID-19 pandemic added to these challenges, resulting in school closures that led to absenteeism and dropout, as well as learning loss. In addition to the health crisis, the education system faces the annual damage caused by weather events, including cyclones, flooding and droughts.

An assessment of the Education Sector Plan objectives indicates that many challenges remain. Repetition and dropout rates in Madagascar remain high. In primary education, the repetition rate increased from 23 per cent in 2018/19 to 31 per cent in 2019/20, far exceeding the Ministry of Education's target of 11 per cent for 2022. The primary school completion rate was just over 50 per cent in 2020, compared to a target of 69 per cent for the year.

Government efforts to fund the education sector have resulted in an increase in the number of teachers and the building of new classrooms in public schools in recent years. Despite the increase in the number of teachers, the pupil-teacher ratio in public primary schools remains high, at around 40 pupils per teacher in recent years.

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5. www.globalpartnership.org/fr/content/plan-sectoriel-de-leducation-2018-2022-madagascar
6. World Bank, forthcoming.

The Education Sector Plan also highlights that the distribution of teachers among regions and schools does not yet follow clear and optimal rules, and that improvements must be made to reduce existing disparities.[7] Strategies and guidelines have therefore been revised to address new challenges, including intake capacity, school retention, teachers' and educators' qualifications, and implementation of curriculum reform since 2018.

7. See the Teachers for All: Improving Teacher Deployment in Madagascar research programme led by UNICEF Innocenti.

3. Data

Data: Description of administrative and exam datasets

This study covers all public primary schools in Madagascar. The decision to focus the analysis on public schools was based on the objective of identifying behaviours and practices that could later be scaled up during stage 3 of the DMS research (see Appendix A for details of the different research stages), to benefit as many children as possible. Private schools account for a minority of schools, have more resources and enjoy greater independence in defining their strategies. Studying the primary cycle allows us to focus on the factors that influence basic learning, given that only about half of children in Madagascar complete their primary education according to UNESCO statistics.[8]

The quantitative analyses are based on two administrative databases produced by the Ministry of Education:

1) Education Management Information System (EMIS) databases from 2017/18 to 2020/21. These contain administrative information about Madagascar's schools and the students enrolled in them, as well as information about school staff.

2) CEPE results databases from 2018 to 2021, which provide information to identify schools, certain student characteristics (gender, age), as well as average CEPE scores and student pass rates.

The EMIS data collection process, the details of the information in the databases, and the process of creating the dataset as part of the first stage of DMS research (quantitative analysis) are described in **Appendices B, C and D**.

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8.   http://data.uis.unesco.org/
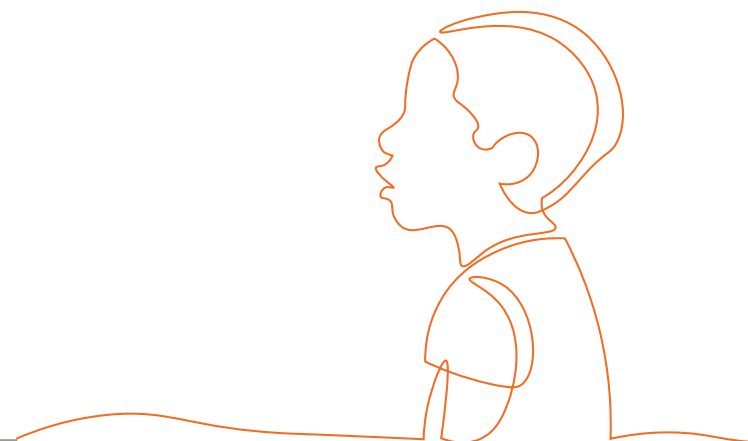
4. Modelling of performance factors

Modelling of performance factors

1. Selection and construction of performance variables

The two types of performance indicators considered in this study and selected with the Ministry of Education Directorate of Education Planning team are **i)** student promotion rates from one grade to the next, and **ii)** CEPE results.

1. Promotion rate

The promotion rate is the percentage of students in a given class who move up to the next class the following year. It is a key education system indicator, measuring the proportion of students who have acquired sufficient knowledge to move up to the next year (students who are not promoted repeat the year or leave school). Using the EMIS database, it is possible to calculate promotion rates for years T1 to T4 separately for girls and boys.[9]

2. The average score obtained in the end-of-primary school (CEPE) or end-of-lower-secondary school (BEPC) examinations

The average CEPE score relates to students who have reached the end of primary education (year T5) and gives a reliable indication of their level of learning.

3. CEPE and BEPC pass rate

The CEPE pass rate is the percentage of students who obtained the minimum average score required to pass. This varies between 9 out of 20 and 10 out of 20, depending on the district. This indicator is related to the previous one, but allows the factors related to student progression in secondary education to be analysed. In recent years, the CEPE pass rate has averaged around 50 per cent for students from public primary schools in Madagascar.

Using the promotion rate as an indicator of school performance has some limitations. At the national level, there are common guidelines on repeating a year (in Madagascar, a mark above the threshold of 10 out of 20 is usually required for passing), but they can vary slightly and marks are not standardized across schools. Other factors may be involved in the decision to repeat a year, such as teachers' assessment and the school's capacity. Nevertheless, in countries such as Madagascar where students are not automatically promoted to the next year, this indicator provides important information and is closely linked to student and school performance.

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[9] The promotion rates for T1 are those calculated for promotion from T1 to T2 and so on. Promotion rates for T5, the final year of primary education, are not included because of the high proportion of students who do not continue their education beyond primary school.

The two types of performance indicator described previously are calculated using different student samples and do not measure exactly the same things. While all primary school students are taken into account when calculating promotion rates, the CEPE figures refer only to students who have reached the end of the primary cycle. Promotion rates provide information on the ability of the school system to ensure students progress from one year to the next, while CEPE scores reflect the body of knowledge acquired during primary school. Studying these two indicators makes it possible to obtain rich additional information about the factors underlying different performance measures.

2. Descriptive statistics

a) Performance variables

Based on the four school years available in the EMIS datasets, it is possible to calculate three separate promotion rates (2017/18 to 2018/19, 2018/19 to 2019/20 and 2019/20 to 2020/21).[10] The promotion rates for girls and boys are very similar, with the promotion rate for girls being slightly higher, indicating good gender parity (**Graph 1**). Promotion rates vary by year group: between 50 and 65 per cent of students in a given year progress to the next year over the period. Differences of up to 24 percentage points can be seen between regions (46 per cent for Ihorombe and 70 per cent for Analamanga – **Graph 2**). Promotion rates trended slightly upwards over the period observed (**Graph 3**).

Graph 1: Primary school promotion rates by year and gender (averages from 2017/18 to 2020/21)

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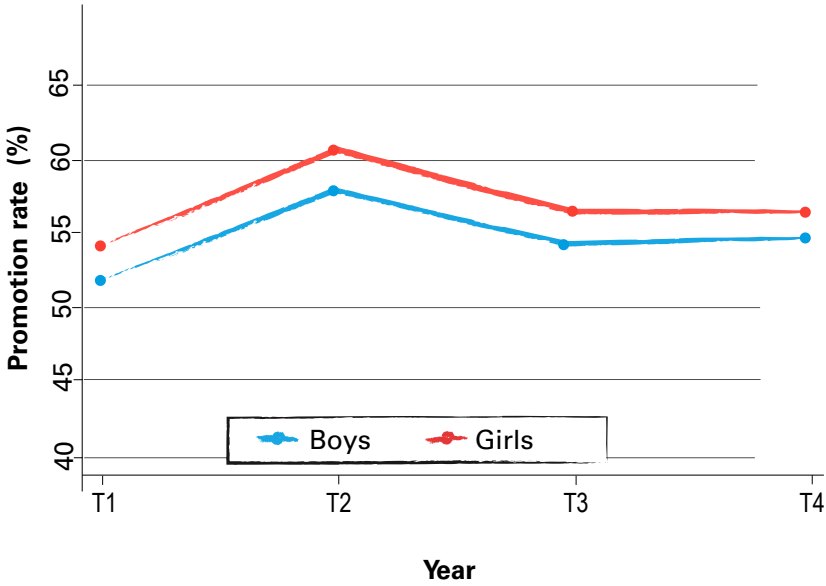
[10] The promotion rate variable is capped at 100 per cent. Approximately 13 per cent of observations correspond to promotion rates above 150 per cent, replaced by missing values; and approximately 10 per cent of observations correspond to promotion rates between 100 per cent and 150 per cent, replaced by 100 per cent. This allows extreme values to be removed while allowing some margin of error in the data.

Graph 2: Primary school promotion rates by region (averages from 2017/18 to 2020/21)
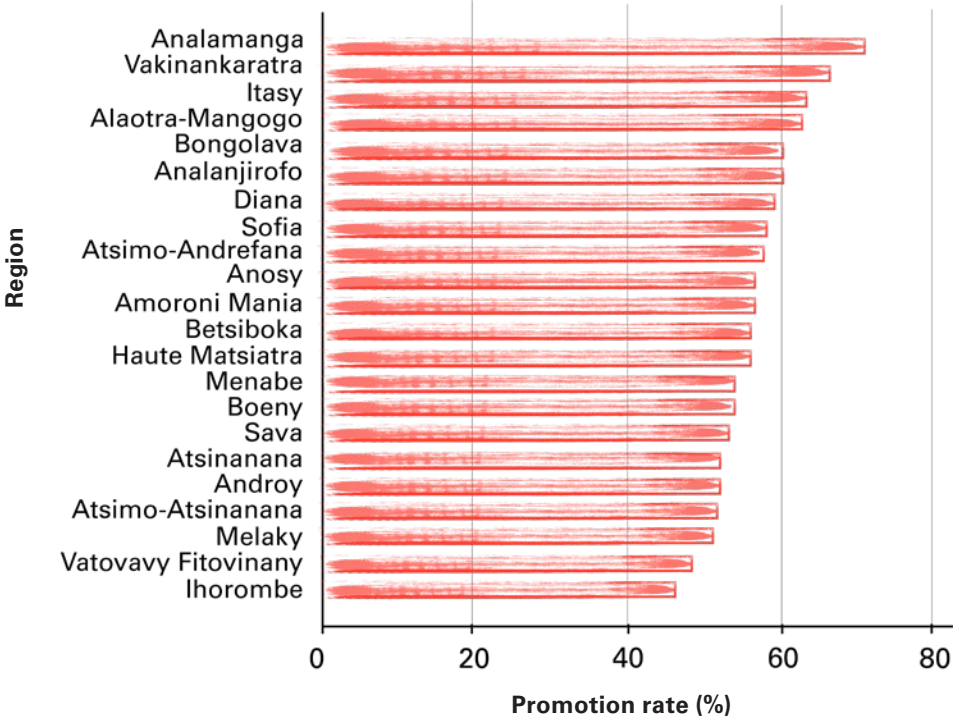
Graph 3: Promotion rate by year group and school year
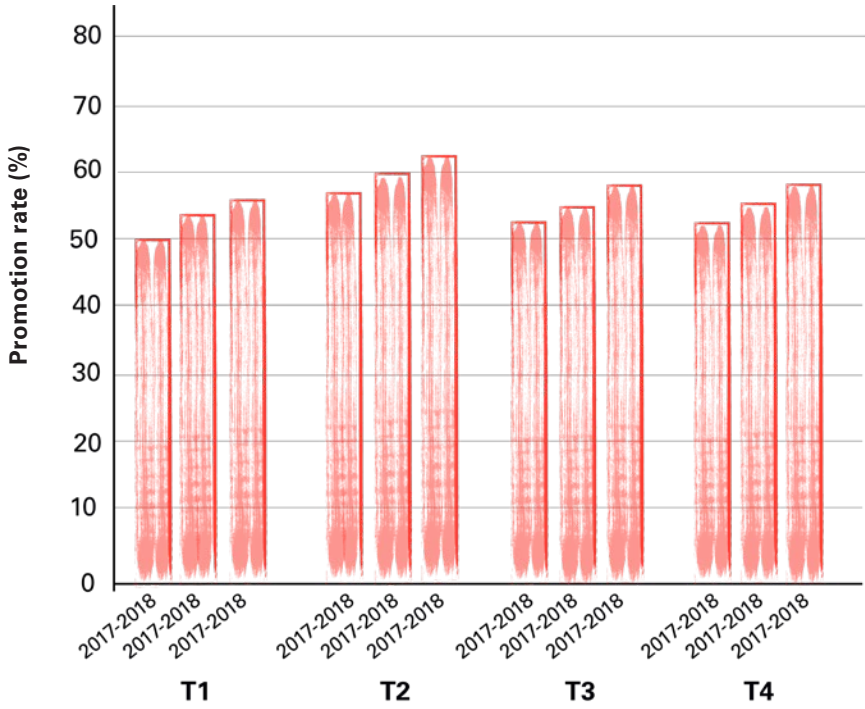
Graph 4 shows the average scores obtained by candidates in the CEPE, by school year. These average scores range from seven to nine points on a scale of zero to 20, with a slight upward trend. CEPE pass rates follow a similar pattern, hovering around 50 per cent. As with the study of promotion rates, **Graph 5** highlights significant regional differences in average CEPE scores (ranging from 5.8 for Vatovavy Fitovinany to 9.6 for Analamanga).

Graph 4: Average CEPE scores by school year
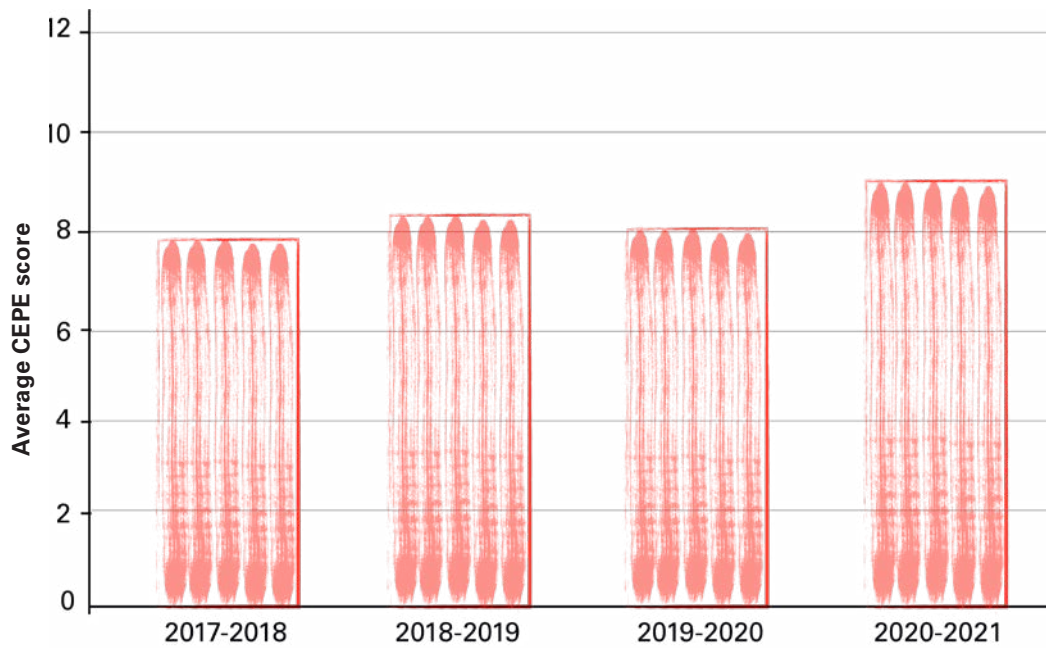
Graph 5: Average CEPE scores by region (average from 2017/18 to 2020/21)
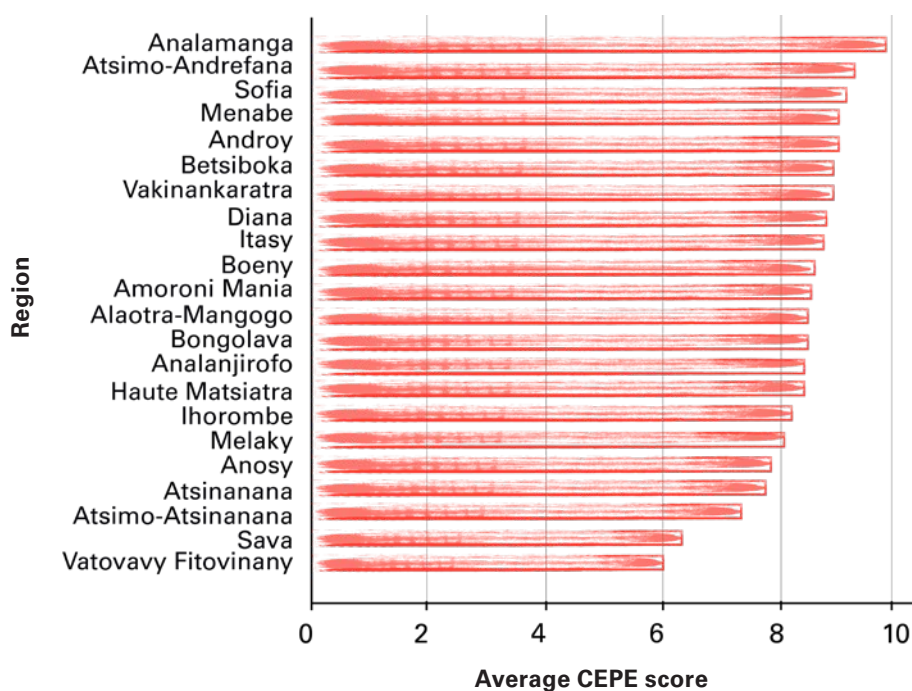
Variability of the indicators studied and impacts of the COVID-19 crisis

Although the COVID-19 crisis has had a negative impact on the education system in Madagascar, the data do not show any break in the trends for promotion rates and CEPE scores in 2020 and 2021. To further explore the possible impacts of the crisis on the results studied, it is possible to examine the changes in promotion rates and CEPE results by year (**Graphs A.1, A.2 and A.3 in the appendices**).

The number of schools with 100 per cent promotion rates increased in 2019/20 to 11 per cent, up from 7 per cent in 2018/19 (**Graph A.1 in the appendices**).[11] This suggests that the COVID-19 crisis may have had some, albeit limited, impact on the rules around promotion.[12] A similar trend can be observed in the CEPE pass rate (**Graph A.2 in the appendices**). The proportion of schools whose students achieved a 100 per cent CEPE pass rate increased to 8 per cent in 2020/21 from 4 to 5 per cent in previous years, suggesting that the COVID-19 crisis may have had an impact on the organization of examinations and/or pass criteria.

Overall, analysis of the distribution of outcomes suggests that the COVID-19 crisis affected promotion rates and CEPE scores, but that these impacts were limited.[13]

b) Explanatory variables

Tables 2 and 3 present the characteristics of the two categories of variable in the EMIS datasets (variables relating to schools and to staff). The key observations regarding these statistics are summarized as follows.

School and enrolment data

The majority of schools are medium-sized schools in rural areas. In 2020/21, 95 per cent of the schools in the sample were located in rural areas and had a total enrolment of around 150 students, with an average of three classes. Though in the minority, urban schools have on average twice the number of students as rural schools.

Very few schools have canteens, but in those that do, almost all students are registered for them. The percentage of schools with canteens varies widely across regions, from 0 per cent in several regions to 34 per cent in Androy in 2020/21 (**Graph A.4 in Appendix F**). Schools with canteens also appear to have infrastructure that is in better condition.

Data on school infrastructure show a deterioration in recent years. The proportion of classes in good condition decreased from 59 to 42 per cent between the first and last years observed. The majority of schools have boys' or mixed latrines (60 per cent), but the proportion of latrines in good condition decreased from 35 to 26 per cent during this period. Similarly, only 15 per cent of schools had girls' latrines in good condition in 2020/21, compared with 21 per cent in 2017/18. The number of seats per student also decreased from 0.55 to 0.50 over the last two years for which data are available.

School infrastructure and the availability of canteens vary considerably by region (see Graphs A.5 and A.6 in Appendix F). In 2020/21, the proportion of schools with girls' latrines in good condition ranged from 4 per cent (Ihorombe) to 44 per cent (Analamanga), and the number of seats per student ranged from 0.2 (Androy) to 0.9 (Analamanga).

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[11] These observations are based on years T1 to T4 in schools.
[12] In schools that were not able to hold end-of-year assessments, the official instructions for promotion to the next year were to use students' performance in periodic examinations and spot assessments where applicable.
[13] A 2021 Ministry of Education study of a representative sample of 122 schools indicates that public primary schools were closed for 10.7 weeks on average during the COVID-19 crisis.

About a quarter of the schools do not have all grades available, so they do not offer a full primary education (T1, T2, T3, T4 and T5).

Student information indicates that the vast majority of students live near their school (90 per cent live within 2 km). There is an even distribution of girls and boys, and just under 30 per cent of students are repeating the year (all grades combined).

The proportion of students who attended preschool doubled between 2017/18 and 2020/21, from an average of 12 per cent to 24 per cent. These figures reflect the significant efforts undertaken by the Ministry of Education to strengthen preschool education provision in recent years.

The pupil-teacher ratio is around 40, a relatively stable figure over the observation period.

Data on school staff

The profile of head teachers and teachers indicates a relatively high degree of gender parity in Malagasy schools. On average, 35 per cent of head teachers and 41 per cent of teachers in 2020/21 were women. As a comparison, the percentage of female head teachers in other African countries for which data are available is much lower, averaging between 10 and 20 per cent.[19] The proportion of female school staff varies considerably across regions: the percentage of female head teachers ranges from 16 per cent in Sava to 60 per cent in Analamanga,

Table 2: Descriptive statistics on public primary schools

	2017/18	2018/19	2019/20	2020/21
Schools in rural areas (%)	92	94	95	95
Schools with a canteen (%)	7	6	7	6
Schools with a FEFFI committee[14] (%)	73	83	85	87
Schools with a contracted school project[15] (%)	37	43	45	54
Number of classes	3.2	3.2	3.2	3.3
Classrooms in good condition (%)	59	48	44	42
Schools with girls' latrines in good condition (%)	21	17	16	15
Schools with boys' or mixed latrines in good condition (%)	35	28	27	26
Number of seats per student	0.55	0.55	0.55	0.50
Schools that do not have all grades available (%)	25	27	27	25
Total number of students	153	142	143	163
Students living more than 2 km away (%)	11	10	10	10
Girls (%)	50	50	50	50
Students repeating a year (%)	29	27	27	28
Students who attended preschool (%)	12	18	21	24
Mixed-level classes (%)	67	64	64	62
Pupil-teacher ratio	41	38	37	41
Textbook-student ratio	1.07	1.36	1.30	1.43
Total number of schools	**25,540**	**25,869**	**26,273**	**26,752**

Note: These averages are calculated from aggregated school-level data.

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[14] FEFFI (*Farimbon'Ezaka ho Fahombiazan'ny Fanabeazana eny Ifotony*) is a school management committee made up of various stakeholders (parents, teachers, the local community, officials from decentralized services).
[15] The *projet d'établissement contractualisé* [contracted school project – PEC] is a school management strategy supported by Ministry of Education. It aims to improve access, retention, quality of education and governance within the framework of the FEFFI committee.

and the percentage of female teachers ranges from 24 per cent in Sofia to 66 per cent in Analamanga (**Graphs A.7 and A.8 in Appendix F**).

The proportion of teachers with a bachelor's degree has increased slightly. On average, 30 per cent of teachers and 23 per cent of head teachers held bachelor's degrees in 2020/21. In theory, primary school teachers should have a bachelor's degree, but this is not always the case in practice. Efforts are currently under way to establish minimum qualification requirements at the national level. There are significant regional disparities in this regard: the proportion of teachers with a bachelor's degree ranges from an average of 9 per cent in Anosy to an average of 57 per cent in Analamanga (**Graph A.9 in Appendix F**).

An increase can also be seen in the proportion of head teachers and teachers with FRAM status, i.e. who were recruited by parent-teacher associations. In 2020/21, 30 per cent of heads and 65 per cent of teachers had FRAM status. Head teachers and teachers with FRAM status are in a more precarious situation than civil servants or staff on state contracts. At the same time, there has been an increase in the proportion of FRAM contracts that are not subsidized by the state at the expense of those that are (**Graphs 6 and 7**). Head teachers with unsubsidized FRAM status are twice as likely to have a bachelor's degree as those with subsidized FRAM status (42 per cent and 18 per cent, respectively, in 2020/21).[16]

The proportion of staff with civil servant status has been declining in recent years, and head teachers are still more likely than teachers to be civil servants (**Graphs 6 and 7**).

Table 3: Staff characteristics

	2017/18	2018/19	2019/20	2020/21
Average age of head teacher	42	41	41	41
Female head teachers (%)	35	35	35	35
Head teachers who are civil servants (%)	26	21	16	16
Head teachers on state contracts (%)	46	50	52	53
Head teachers with FRAM status (%)	27	29	32	30
Head teachers with a bachelor's degree or higher (%)	20	22	22	23
Average age of teachers	34	34	34	34
Female teachers (%)	42	41	41	41
Teachers who are civil servants (%)	7	5	4	5
Teachers on state contracts (%)	30	29	27	28
Teachers with FRAM status (%)	58	60	65	65
Teachers with a bachelor's degree or higher (%)	22	25	28	30
Total number of schools	**25,540**	**25,869**	**26,273**	**26,752**

Note: These averages are calculated from aggregated school-level data. "Teachers" include teachers, other teaching staff and trainee teachers responsible for at least one class.

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[16] This may be related to the fact that head teachers with unsubsidized FRAM status are, on average, seven years younger than those with subsidized FRAM status, and degree requirements have changed over time.

Graph 6: Teacher status by year
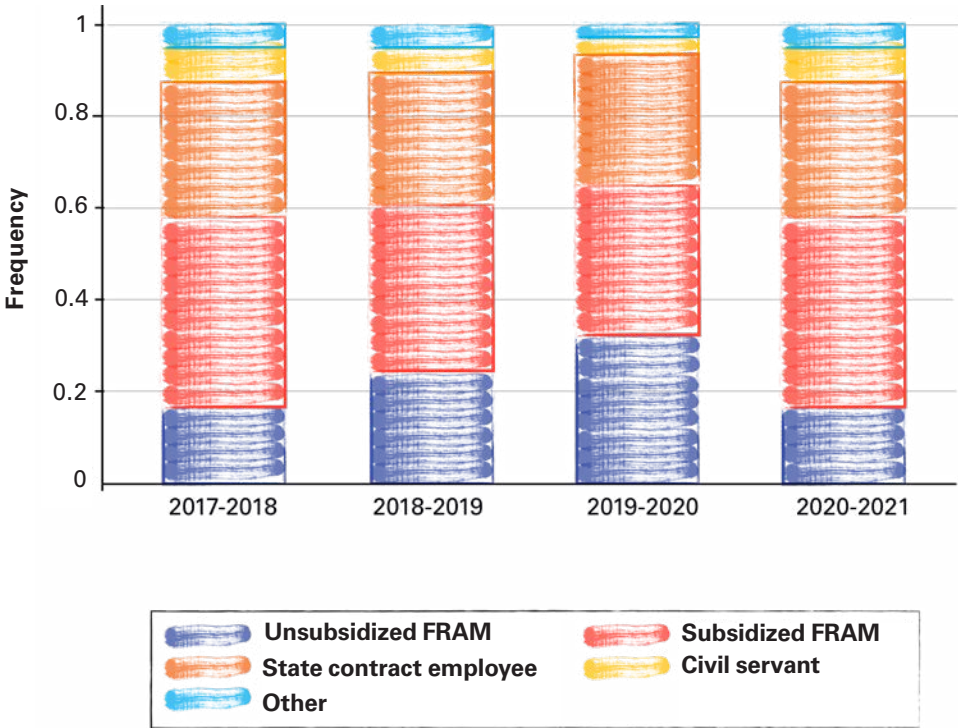
Graph 7: Head teacher status by year
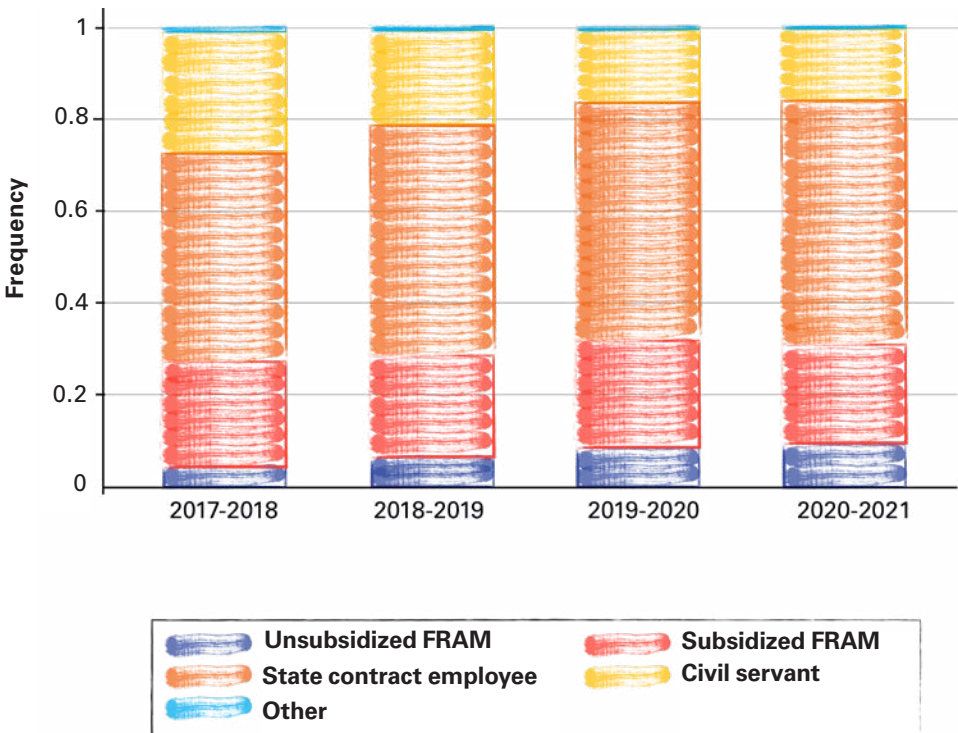
3. Methodology

Estimated model

Analysis of the associations between the different explanatory variables (at the school, student and staff levels) and school performance variables is based on multivariate linear regressions.[17] In analyses based on CEPE scores, the performance variables are averages calculated at the school level. In analyses where the performance variable is the promotion rate, it is possible to use more-detailed observations corresponding to the different year groups in primary school, from T1 to T4. This allows more observations to be included in the analysis and increases the accuracy of the estimated coefficients.[18]

Selection of explanatory variables

The explanatory variables were selected based on different criteria, the first being their relevance in explaining the performance variables being studied. The selected variables also need to be correctly entered and available for the entire period under consideration. To be informative, variables also need to show some variability (if very few schools have a certain characteristic, for example, it will be difficult to estimate a coefficient). Finally, including variables that do not offer sufficient variation in the model makes it more difficult to estimate their coefficients. In the present case, there is a strong correlation between the number of textbooks for different subjects within a single school. It is therefore difficult to simultaneously estimate the relationship between the availability of different types of textbooks and school performance, and it is more informative to estimate these correlations based on the total number of textbooks per student. This figure is obtained by adding up the total number of all different types of textbooks available (French, mathematics, Malagasy, history, geography, etc.), and dividing this sum by the number of students (this calculation is done separately for each year group).

Robustness tests

To verify whether the results obtained are valid for different selections of estimated models, regressions using alternative models were estimated. The results of these tests are detailed in **Appendix G**.

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[17] The estimated equations take the form $Y_{it} = f\left(x_{it1}, x_{it2}, xt_{it3}, \ldots, x_{itn}\right)$. Y_{it} denotes the performance variable considered for school i and year t, and the variables $x_{it1}, x_{it2}, x_{it3}, \ldots, x_{itn}$ denote the different explanatory variables calculated for school i and year t.
[18] It would also have been possible to take into account, for a given school, the product of the promotion rates for years T1 to T4 as an outcome variable. However, this analysis would have required excluding schools that do not have all grades available and considering a model with school-level observations.

5. Findings

Findings

1. Models based on promotion rates

The models that use promotion rates as the performance variable, shown in Table 4, use fixed effects at the CISCO (school district authorities) level, for the school year and for the year group (T1 to T4). This allows unobservable factors that vary across school district authorities, school years and year groups, and which may affect promotion rates, to be taken into account. For example, if changes related to COVID-19 affected all schools equally in 2019/20, including fixed effects for the years allows more accurate coefficients to be obtained. Nearly 220,000 observations are available in these models (columns 1 to 3).[19] The main findings are described below.

School characteristics

Rural schools score slightly lower than urban schools. These differences reflect, in particular, girls' results (promotion rates are one percentage point lower). There is no significant difference in the results achieved by boys.

Canteens in schools are associated with an increase of around 1.5 percentage points in promotion rates; however, very few schools have a canteen (6 per cent in 2020/21).

The availability of girls' latrines in good condition is associated with higher promotion rates for all students (almost one percentage point higher), as is the proportion of classrooms in good condition (although the latter coefficient is modest). The number of seats per student also correlates positively with promotion rates. Overall, these findings suggest that a school's material conditions may have an influence on promotion rates.

The existence of mixed-level classes has a negative effect on promotion rates, reducing them by 3.7 percentage points. This correlation is slightly more pronounced for girls. On average, 60 per cent of classes in the sample are mixed-level. This negative effect may be attributed to the reduced teaching time in these classes (25 hours per week compared with 27.5 hours for standard classes), and/or the less favourable learning conditions, as teachers have to divide their teaching time between two different year groups.

There is a negative correlation between the pupil-teacher ratio and promotion rates. An increase of five students (ratio rising from 40 to 45, for example) is associated with a 1.6 percentage point decrease in promotion rates on average.

There is a positive correlation between the textbook-student ratio and promotion rates. Moving from one to two textbooks per student, for example, is associated with an increase of about 0.8 percentage points in promotion rates.

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[19] As mentioned earlier, this model is calculated using observations corresponding to grades T1 to T4.

Student characteristics

The proportion of students living more than 2 km from school is negatively correlated with promotion rates, and the coefficient is higher for boys. This correlation is modest: a 10 per cent increase in the number of students living more than 2 km from school is associated with a 0.1 percentage point decrease in the overall promotion rate.

There is a positive correlation between the percentage of students who attended preschool and promotion rates. This correlation is stronger for girls: a 10 percentage point increase in preschool attendance is associated with a 0.6 percentage point increase in the promotion rate for girls.

Staff characteristics

Female-led schools perform better on average. A female head teacher is associated with a 0.5 percentage point increase in the promotion rate for girls. Data from other sub-Saharan African countries also show a positive association between female head teachers and school performance.[20]

Schools with a higher proportion of female teachers also perform better. A 20 per cent increase in the proportion of female teachers is associated with a 0.2 percentage point increase in the promotion rate for girls. These differences are not observed among boys.

Schools where the head teacher has FRAM status perform significantly less well (by 3 percentage points) than those where the head teacher is a civil servant. This finding also applies, to a lesser extent, to head teachers on state contracts or other types of contracts. This correlation is not as clear in the case of teachers, suggesting that the impact of staff status on educational outcomes may depend on the position held.

Having a more highly educated headteacher or teachers (holding a bachelor's degree or higher) is positively correlated with student promotion rates, suggesting that more-educated teachers are, on average, more successful. On average, the presence of a head teacher with a bachelor's degree or higher is associated with a 1 percentage point increase in the overall promotion rate. This underscores the importance of efforts to establish minimum qualification requirements for school staff.

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[20] See UNICEF, *Increasing Women's Representation in School Leadership*. 2022.

Table 4: Factors associated with student promotion rates in primary school

	(1) Overall promotion rate	(2) Promotion rate for girls	(3) Promotion rate for boys
School and student variables			
Schools in rural areas	-0.568***	-1.137***	-0.063
School with a functioning FEFFI committee	-0.320**	-0.249	-0.184
School with a contracted school project	0.122	0.088	0.223
School with a canteen	1.475***	1.436***	1.642***
Classrooms in good condition (%)	0.338***	0.370***	0.338**
School with girls' latrines in good condition	0.892***	0.790***	0.857***
Number of seats per student	3.285***	3.697***	2.385***
Schools that do not have all grades available	-0.874***	-1.171***	-0.635***
Total number of students in school	0.028***	0.028***	0.028***
Students living more than 2 km away (%)	-1.126***	-0.877***	-1.320***
Girls (%) (grade)[21]	-0.693	-26.494***	22.228***
Students who attended preschool (%) (school)	5.670***	6.019***	5.267***
Mixed-level class (grade)	-3.658***	-4.070***	-3.332***
Pupil-teacher ratio (grade)	-0.316***	-0.270***	-0.296***
Textbook-student ratio (grade)	0.818***	0.747***	0.708***
Staff variables			
Age of head teacher	-0.002	0.005	-0.002
Female head teacher	0.319***	0.532***	0.041
Reference group: civil servants			
Head teacher with FRAM status	-2.908***	-3.359***	-2.748***
Head teacher on state contract	-1.728***	-1.960***	-1.574***
Director on other contract	-2.172***	-2.956***	-2.312***
Head teacher with a bachelor's degree or higher	1.020***	1.108***	0.897***
Average age of teachers (grade)	0.069***	0.081***	0.053***
Female teachers (%) (grade)	0.652***	0.984***	0.232*
Reference group: civil servants			
Teachers with FRAM status (%) (grade)	-0.177	0.113	-0.387
Teachers on state contracts (%) (grade)	0.131	0.432	-0.149
Teachers on other contracts (%) (grade)	-0.259	-0.391	-0.189
Teachers with a bachelor's degree or higher (%)	1.240***	1.338***	1.043***
Other controls			
Constant	57.440***	70.754***	44.038***
Fixed effects at the school district authorities level	✔	✔	✔
School year fixed effects	✔	✔	✔
Year group (T1–T4) fixed effects	✔	✔	✔
Observations	225,218	221,999	222,668
R-squared *** p<0.01, ** p<0.05, * p<0.1	0.189	0.172	0.136

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[21] The reasons for the high coefficients associated with the percentage of girls in the model are not clear, but could be related to a selection effect. While, in classes with a higher percentage of girls, girls perform less well on average (which may, for example, be related to an effort to retain girls who are struggling), and vice versa, the promotion rate for girls lowers as the proportion of girls increases. The reverse will be true for boys.

2. Models based on CEPE scores

The models based on CEPE scores, which apply fixed effects at the school district authorities and school year level, are presented in Table 5. The explanatory variables taken into account are those associated with the T5 year group, which are more relevant for explaining CEPE scores than school-level averages. Average CEPE scores are standardized so that the model coefficients can be interpreted as standard deviations.[22] These models do not include gender-disaggregated results, as this would significantly reduce the sample size (averages are calculated for schools with at least five candidates). Approximately 36,000 observations (at the school level) are available for these models. The main findings are described below.

School characteristics

In contrast to the models based on promotion rates, we find that, all else being equal, **rural schools on average achieve higher CEPE pass rates** (by 2.6 percentage points), even though the average scores are not significantly different. This may be related to selection effects. For example, it might be that students in rural areas (who enjoy less favourable conditions than students in urban schools) who take the CEPE are those that perform at an above-average level.

The presence of a FEFFI (school management committee involving local stakeholders) and the implementation of a contracted school project show a positive correlation with CEPE success variables, whereas there is no significant correlation between these variables and promotion rates. A FEFFI committee is associated with a 0.1 standard deviation increase in the CEPE average score, and an almost 3 percentage point increase in the CEPE pass rate.

The availability of a canteen in a school is associated with an increase in the average CEPE score of 0.1 standard deviation, and an increase of more than 4 percentage points in the CEPE pass rate.

The availability of girls' latrines in good condition and the percentage of classrooms in good condition are positively correlated with CEPE success. The estimated coefficients are relatively modest, as observed in previous models.

Student characteristics

There is a modest negative correlation between the percentage of students living more than 2 km away and the CEPE pass rate.

As in the previous model, **a positive correlation can be seen between the percentage of students who attended preschool and CEPE success.**

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[22] For each observation, the average is subtracted and the resulting value is divided by the standard deviation. This makes it easier to compare the coefficients obtained in different studies using scores as an outcome variable, understanding that their scale may vary between contexts.

Staff characteristics

Having a female head teacher, and having a higher proportion of female teachers are associated with greater CEPE success (having a female head teacher is associated with a 0.8 percentage point increase in the CEPE pass rate).

There is a significant positive correlation between the qualifications of the headteacher and T5 teachers (bachelor's degree) and CEPE scores.

Schools whose head teachers have FRAM status on average perform less well in the CEPE than schools whose head teachers are civil servants (average CEPE scores are 0.17 standard deviation lower and pass rates 5 percentage points lower). This is also true for T5 teachers.

Table 5: Factors associated with CEPE scores

	(1) CEPE average score	(2) CEPE pass rate
School and student variables		
Schools in rural areas	-0.004	2,636***
School with a functioning FEFFI committee	0.139***	2,752***
School with a contracted school project	0.032***	1,195***
School with a canteen	0.126***	4,372***
Classrooms in good condition (%)	0.021*	0.809**
School with girls' latrines in good condition	0.023**	0.608*
Number of seats per student	0.042***	1,383***
Total number of students in school	0.000***	0.018***
Students living more than 2 km away (%)	-0.099***	-1,848**
Students repeating a year (T5) (%)	-0.422***	-15,686***
Students who attended preschool (%) (school)	0.047***	2,599***
Mixed-level class (T5)	-0.083***	-2,108***
Pupil-teacher ratio (T5)	-0.001	-0.066***
Textbook-student ratio (T5)	0.011***	0.455***
Average age of CEPE candidates	-0.039***	-1,166***
Female CEPE candidates (%)	0.103***	3,581***
Staff variables		
Age of head teacher	-0.001**	-0.040**
Female head teacher	0.022**	0.843***

	(1)	(2)
	CEPE average score	**CEPE pass rate**
Reference group: civil servants		
Head teacher with FRAM status	-0.166***	-5,069***
Head teacher on state contract	-0.096***	-2,663***
Director on other contract	-0.160*	-9,926***
Head teacher with a bachelor's degree or higher	0.044***	1,771***
Average age of teachers (T5)	-0.001	-0.075***
Female teachers (%) (T5)	0.031***	0.808**
Reference group: civil servants		
Teachers with FRAM status (%) (T5)	-0.062***	-2,727***
Teachers on state contracts (%) (T5)	-0.047***	-1,900***
Teachers on other contracts (%) (T5)	-0.042	-2,764**
Head teacher with a bachelor's degree or higher	0.074***	2,211***
Other controls		
Constant	0.524***	68,101***
Fixed effects at the school district authorities level	✔	✔
School year fixed effects	✔	✔
Observations	**35,996**	**36,002**
R-squared *** p<0.01, ** p<0.05, * p<0.1	0.297	0.243

3. Limitations of the research

A few limitations of the research should be highlighted, and kept in mind when interpreting the results.

The available data only partially explain student performance. Other elements – such as students' family or socioeconomic backgrounds, or the various behaviours and practices in place in schools – also influence performance, but are not observable in the EMIS databases.

The findings obtained allow us to identify correlations between the variables and determine their statistical significance. The coefficients should nonetheless be interpreted with caution, as the analysis does not support the claim that these correlations represent a causal link. For example, while there is a positive correlation between average teacher age and promotion rates in the first model, this does not mean that hiring older teachers will automatically improve student outcomes. It is possible, for example, that schools with older teachers also have other characteristics that influence outcomes but which are not observable in the EMIS databases.

6. Conclusion

Conclusion

This quantitative study, conducted as part of the first stage of the DMS research in Madagascar, analyses various factors affecting school performance in the country, using two types of educational outcome: promotion rates and CEPE scores.

This analysis shows that certain factors are positively correlated with both promotion rates and improved student success in the CEPE. This is particularly true for school canteens, the percentage of students who attended a preschool, and staff characteristics (i.e. qualification level, status and gender). It is worth noting that female-led schools with female teachers achieve better outcomes on average. Other variables, such as the percentage of students living more than 2 km from the school or the existence of mixed-level classes, are negatively correlated with both types of educational outcome studied.

Conversely, FEFFI committees and the implementation of a contracted school project are only associated with school performance in models based on CEPE scores.

While it should be remembered that correlations between variables do not necessarily reflect a causal relationship between them, the findings obtained provide interesting information that will help inform education policies in Madagascar. On this basis, education policies can focus on the following guidelines to improve student learning:

Set up canteens in the schools that will benefit the most. Although the availability of a canteen is associated with a 1.5 percentage point increase in promotion rates and a rise of more than 4 percentage points in CEPE pass rates, few schools currently have one.

Reduce the number of mixed-level classes where possible. These classes are associated with decreases of 3.7 and 2.1 percentage points in the promotion rate and the CEPE pass rate, respectively. It is important to note that there may be many reasons for these negative correlations that need to be better understood (reduced teaching time, different learning conditions, sharing of teaching time between year groups, and so on).

Continue the Government's efforts to strengthen preschool education provision. A 20 per cent increase in the number of students who attended preschool is associated with an increase of over 1 percentage point in the promotion rate. These findings are consistent with the conclusions of numerous studies that have demonstrated the positive effects of preschool education.

The study of factors related to school performance in Madagascar also highlights elements that need to be further explored to inform education policies in the country. This includes understanding the practices and behaviours that explain why girls, on average, appear to do better in female-led and female-staffed schools.[23] Similarly, it is essential to better understand and quantify the various factors that explain why schools with head teachers who are civil servants appear to be more successful than others. Finally, it is vital to better understand and measure the mechanisms associated with the availability of school canteens, which appear to enable students to perform better. These elements will allow policymakers at different levels to implement solutions in line with their context.

In the next stages of the research, data will be collected to understand the practices and behaviours of positive deviant schools, which outperform other schools operating in similar contexts. This will supplement this analysis and provide a more complete picture of the various factors affecting school performance in Madagascar.

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[23] Female head teachers could play a role in supporting more equitable allocation of resources within schools. See *Teachers for All: Improving Teacher Deployment in Madagascar.* UNICEF Innocenti – Global Office of Research and Foresight, Florence, 2023.

7. Appendices

Appendix A: DMS research stages

Stage 1	(quantitative research)	This stage aims to identify the resources and contextual factors that contribute to school performance. It uses EMIS data, examination data and other available data to analyse the associations between schools' resources and contexts and their performance in terms of learning, retention and gender equity.
Stage 2	(school typology)	This stage categorizes schools according to their resources, their performance and the difficulties presented by their context, and identifies positive deviant schools, i.e. the highest-performing schools among those operating with the same resources in each context.
Stage 3	(behavioural sciences)	This stage selects a sample of schools (based on stage 2 of the research) and identifies the behaviours and practices that characterize positive deviant schools by comparing them with "control" schools operating in similar contexts and with equivalent resources. This stage includes a field survey and classroom and school observations.
Stage 4	(research into implementation)	This stage uses state-of-the-art participatory research methodologies and, working with stakeholders on the ground (at the central, inspectorate, school and community levels), looks for concrete levers to encourage the implementation of the positive practices and behaviours identified previously in schools that are performing less well.
Stage 5	(using the findings)	This stage focuses on disseminating the findings to decision-making bodies and to the various educational stakeholders and partners. It also concentrates on putting into practice the levers identified in stage 4 through the implementation of an action plan that is integrated with the national strategies.

Appendix B: Data collection process

EMIS data are collected each year through the primary survey form, the infrastructure and equipment form and the student form, filled out one month after the start of the school year. The list of information collected through the various forms can be found in Appendix C. These data are collected in a hybrid manner, using paper and/or electronic collection tools (online and mobile versions are being developed). The collection tools are updated every four years to meet the various users' needs.

Officials at different levels (Ministry of Education regional directorates, school district authorities, local education administration districts, and head teachers) are trained in turn to fill out the collection forms. Once checked and verified, the completed forms are forwarded to the school district authorities for data entry and cleaning (with assistance from the regional directorates and the Directorate of Education Planning). The data are then consolidated at the regional directorate level to enable regional and national directories to be created.

The main challenges encountered during data collection are associated with distributing and collecting survey forms from schools and then delivering them to the school district authorities once the checks have been completed. Some head teachers also have difficulties in filling out the forms. At the data processing and analysis level, the main challenges involve: the wide range of procedures and methods used; the lack of computer equipment within regional directorates, school district authorities, local education administration districts and schools; the lack of staff; the absence of collaborative validation bodies and; the lack of a single channel for data processing at all levels of management.

In addition, many examination centres do not have computerized systems, so it takes longer to enter the CEPE data from these centres. The software for entering examination data is not integrated with the EMIS databases, as this information is currently stored in two separate databases that have not been harmonized. More time and effort is therefore required to combine and use the two databases. Improvements along these lines would facilitate the use of data to inform public policy in a more timely manner.

Appendix C: Description of EMIS and CEPE dataset variables

The information collected on the primary survey form is as follows:

Information about the school
The school's partnerships
Number of students and students repeating years (by class, gender, age)
Number of students with disabilities (by class, gender, type of disability)
School health and hygiene
Number of sections

Cost relief for parents (school meals, school kits, uniforms)

Infrastructure (classrooms, latrines, water points, etc.)

School materials and equipment

Textbooks

Examinations (CEPE for primary school, BEPC for lower secondary school, baccalaureate for upper secondary school)

Financial information

Staff list and information

The information collected on the infrastructure and equipment form is as follows:

School estate

Accessibility of the school

Information about the buildings

Information about the classrooms

Information about the school's materials and equipment

Catchment area (where the students come from)

The student form lists the names of students by class, gender, age, disability status, parents' or guardians' status and place of residence.

Appendix D: Merging and preparing datasets for analysis

To enable analysis, preliminary work to prepare and merge the different databases was first carried out (**Figures A-1 and A-2).**
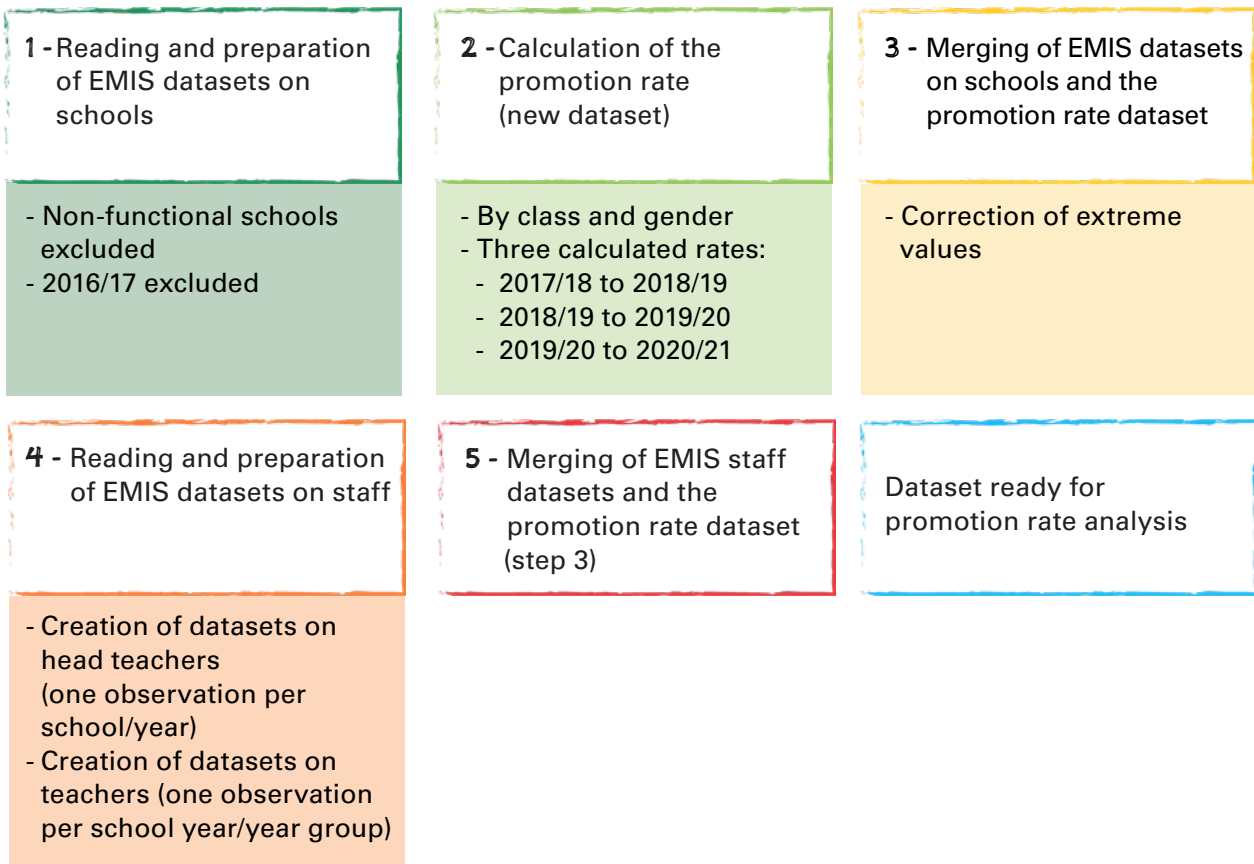
First, the EMIS databases were processed to code and calculate the outcome variables as well as the model's different explanatory variables. Variables containing outliers (probably due to errors) were processed in such a way as to avoid influencing the findings. Between 25,000 and 26,000 schools per school year are included in these databases. About 15 per cent of these schools do not have information on heads or teachers.

Secondly, the CEPE databases were processed and merged with the EMIS datasets to allow correlations to be established between CEPE scores and the various explanatory variables from the EMIS datasets. Approximately 40 per cent of the schools in the EMIS databases had five or more CEPE candidates during the period under observation.[24]
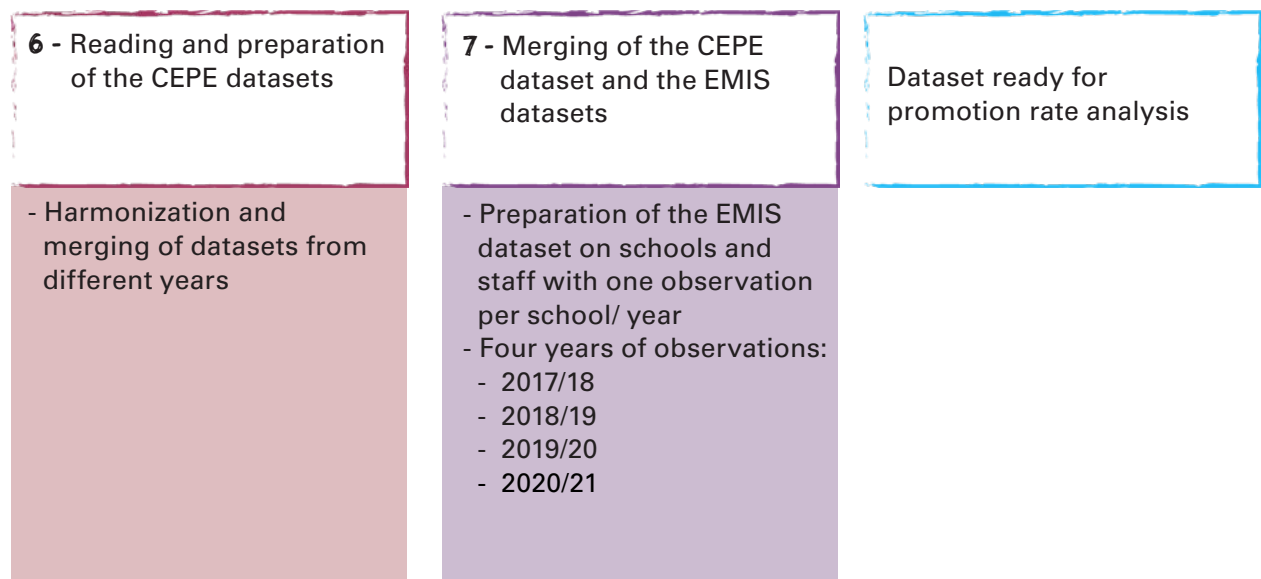
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[24] Schools with fewer than five CEPE candidates are not included in the analysis, in order to enable more reliable school-level averages to be calculated.

Figure A-1: Steps in EMIS database preparation

1 - Reading and preparation of EMIS datasets on schools

- Non-functional schools excluded
- 2016/17 excluded

2 - Calculation of the promotion rate (new dataset)

- By class and gender
- Three calculated rates:
  - 2017/18 to 2018/19
  - 2018/19 to 2019/20
  - 2019/20 to 2020/21

3 - Merging of EMIS datasets on schools and the promotion rate dataset

- Correction of extreme values

4 - Reading and preparation of EMIS datasets on staff

- Creation of datasets on head teachers (one observation per school/year)
- Creation of datasets on teachers (one observation per school year/year group)

5 - Merging of EMIS staff datasets and the promotion rate dataset (step 3)

Dataset ready for promotion rate analysis

Note: 2016/17 is excluded from the analysis because many of the explanatory variables present for the other years are missing or coded differently.

Figure A-2: Steps in CEPE database preparation

6 - Reading and preparation of the CEPE datasets

- Harmonization and merging of datasets from different years

7 - Merging of the CEPE dataset and the EMIS datasets

- Preparation of the EMIS dataset on schools and staff with one observation per school/ year
- Four years of observations:
  - 2017/18
  - 2018/19
  - 2019/20
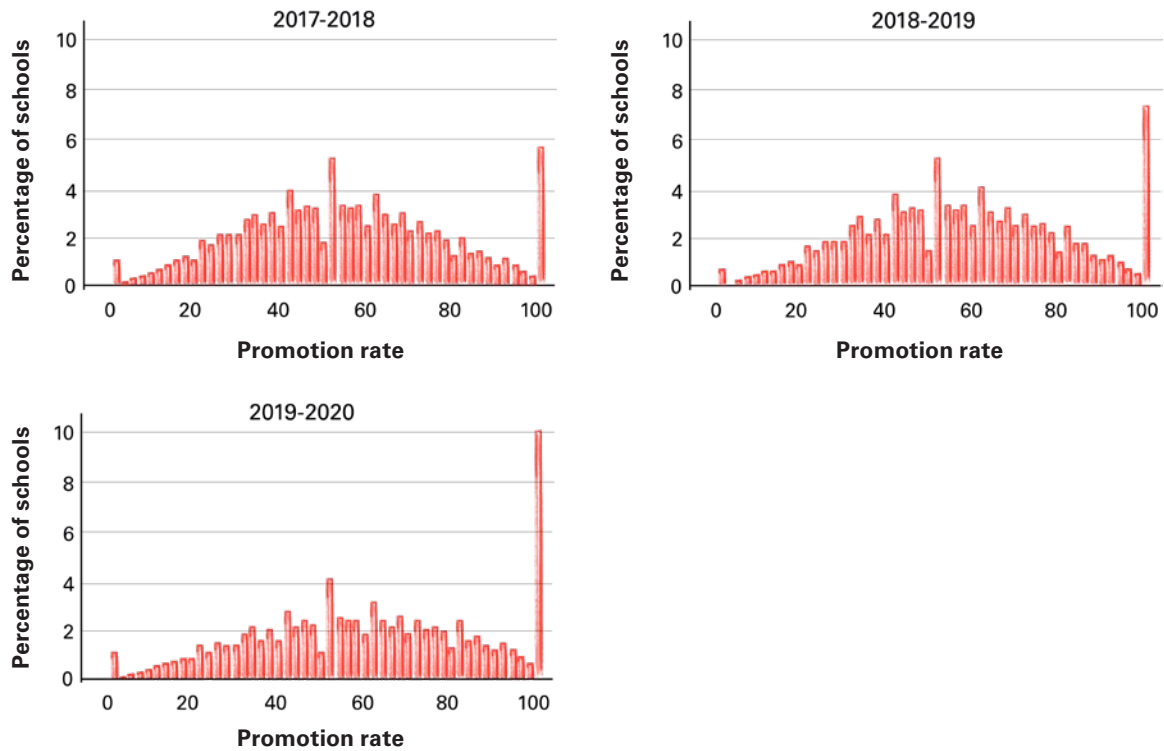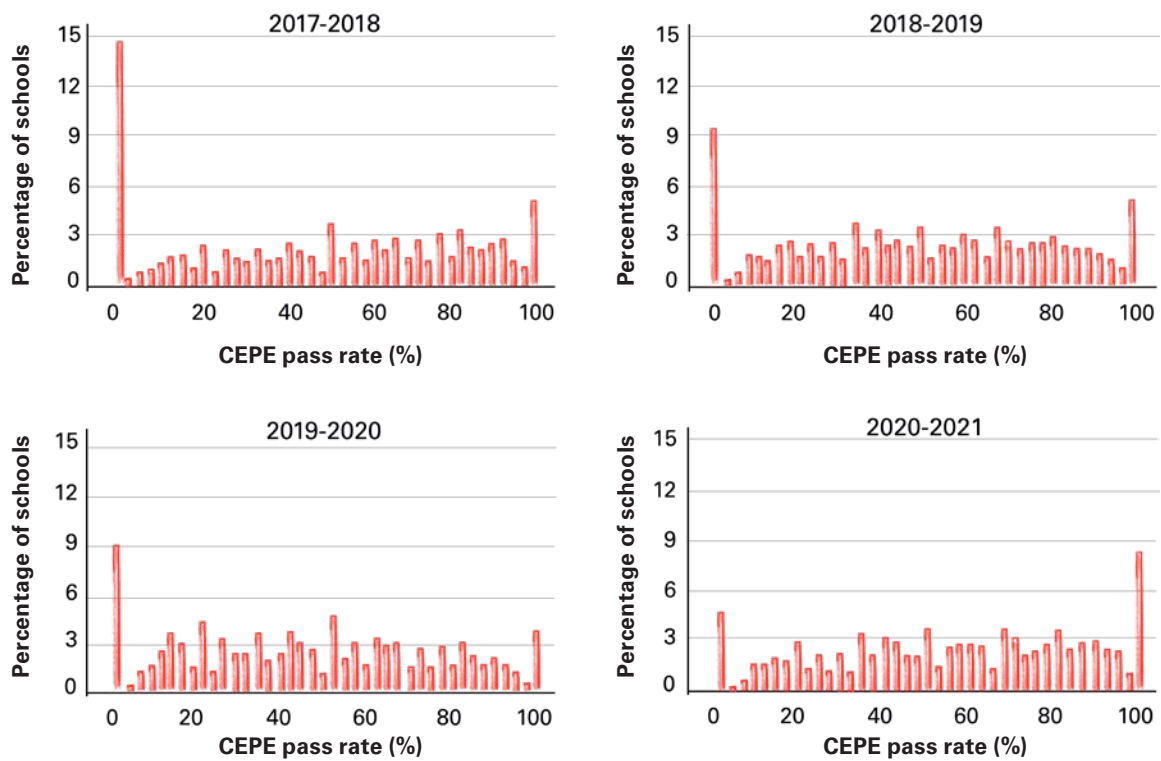 - 2020/21

Dataset ready for promotion rate analysis

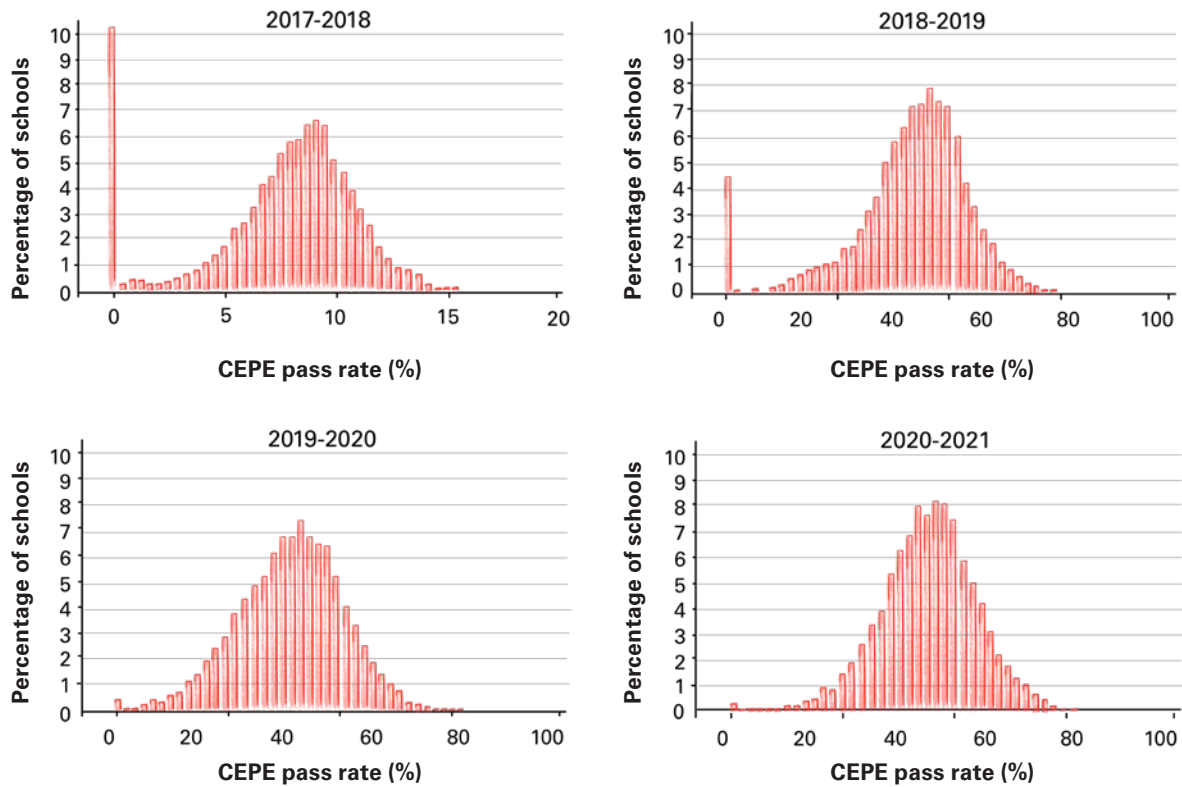# Appendix E: Distribution of performance variables

Graph A.1: Distribution of promotion rates in 2017/18

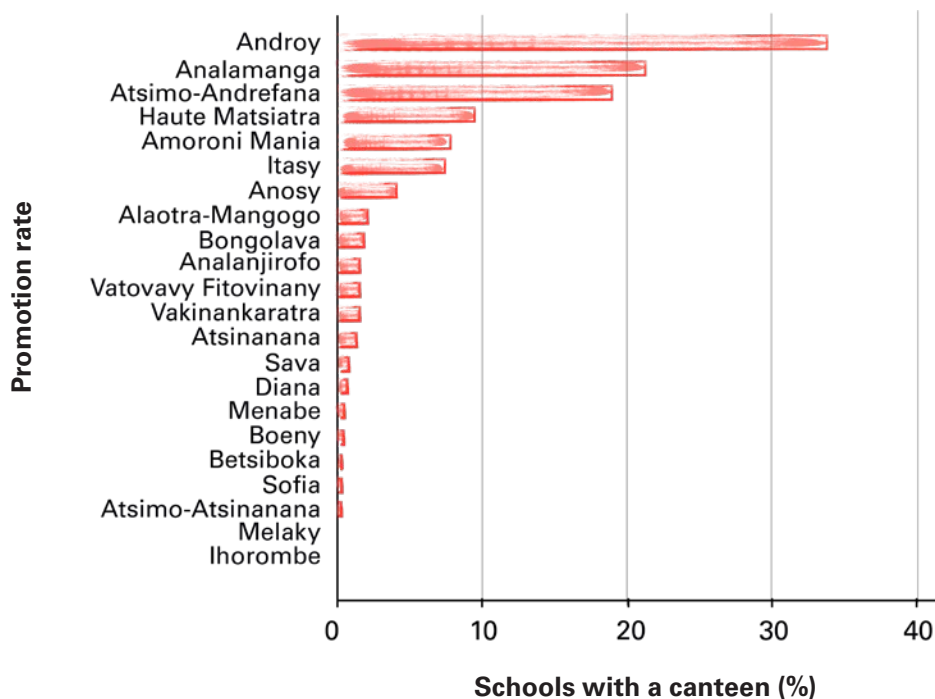
Graph A.2: Distribution of CEPE pass rates by year

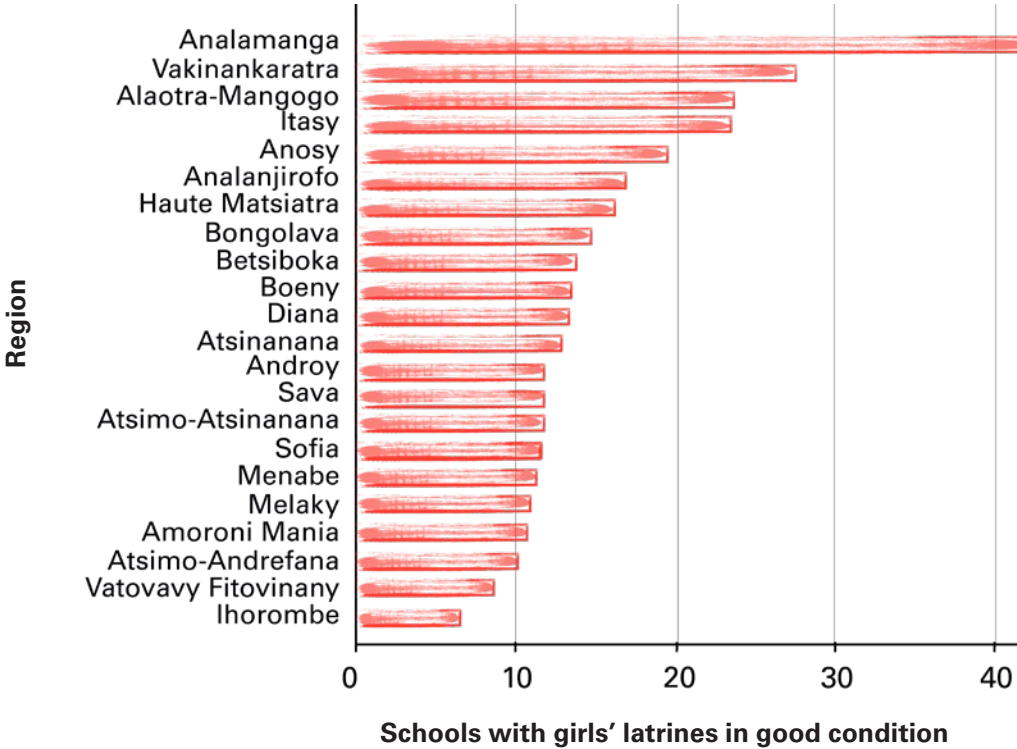**Graph A.3:** Distribution of average CEPE scores by year

2017-2018

2018-2019

2019-2020
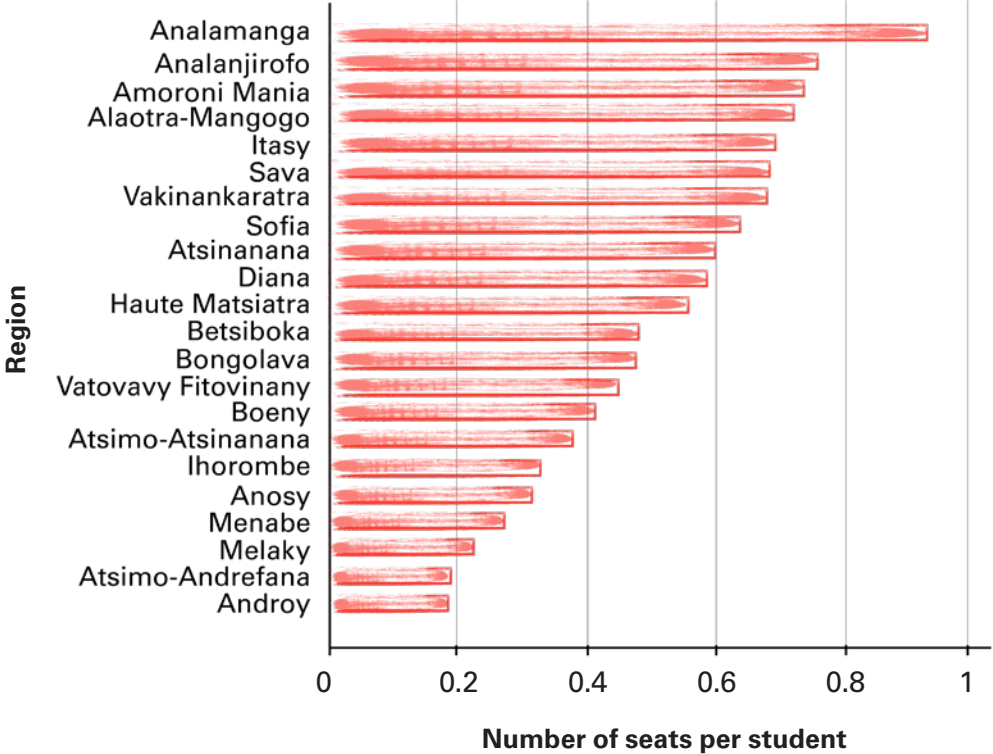
2020-2021

Appendix F: Regional disparities

Graph A.4: Percentage of schools with a canteen by region (2020/21)

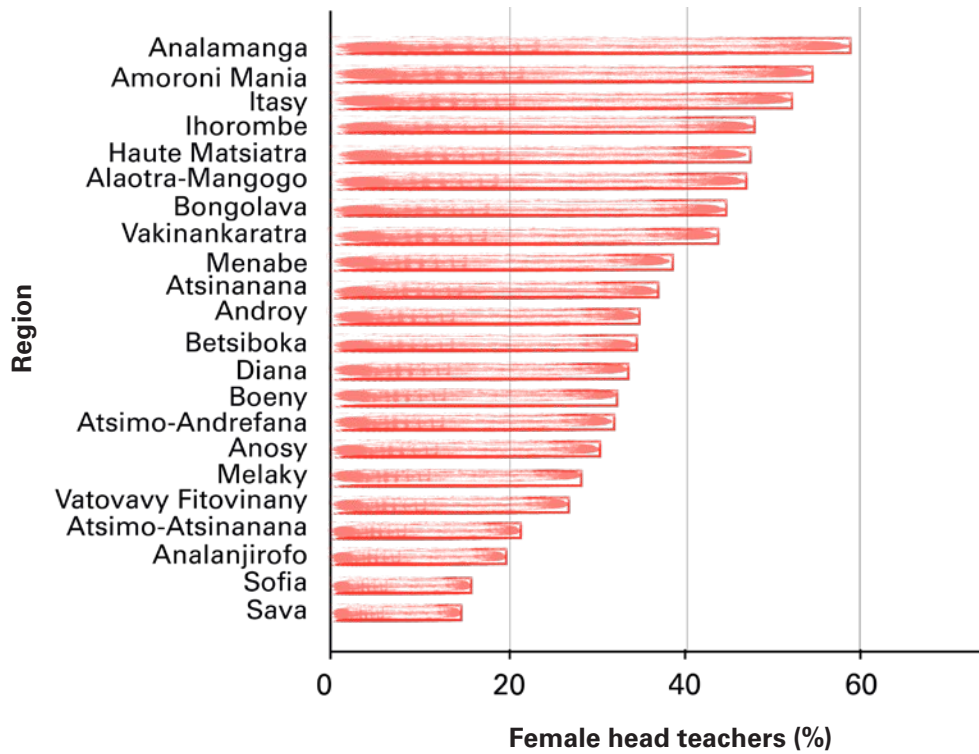**Graph A.5:** Percentage of schools with girls' latrines in good condition by region (2020/21)

Schools with girls' latrines in good condition

Graph A.6: Number of seats per student by region (2020/21)
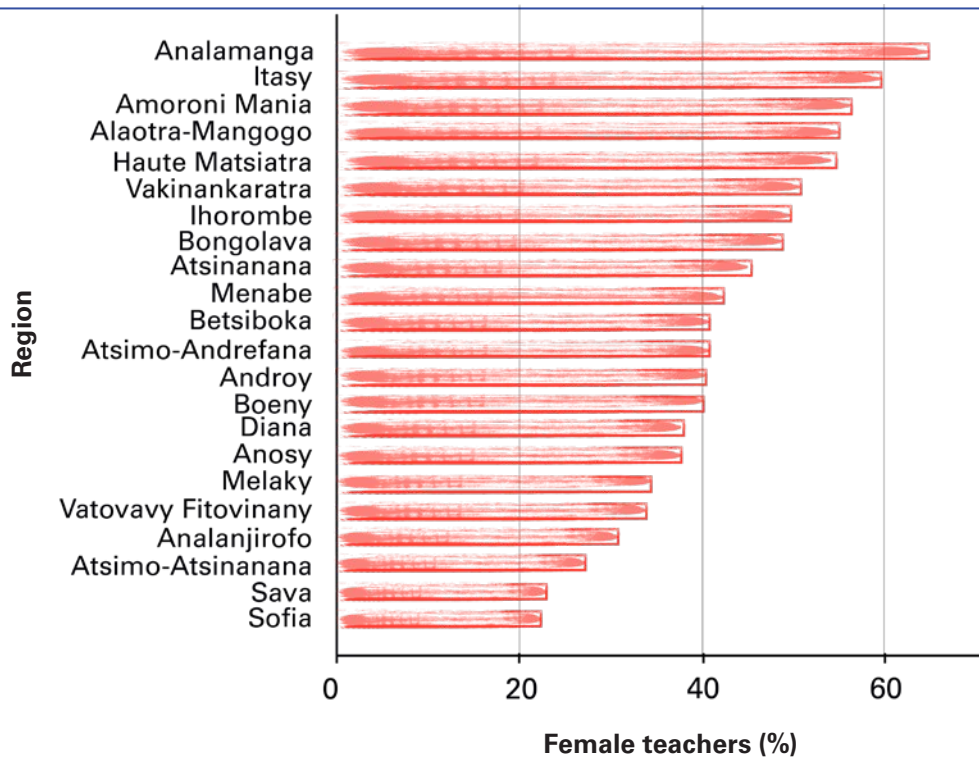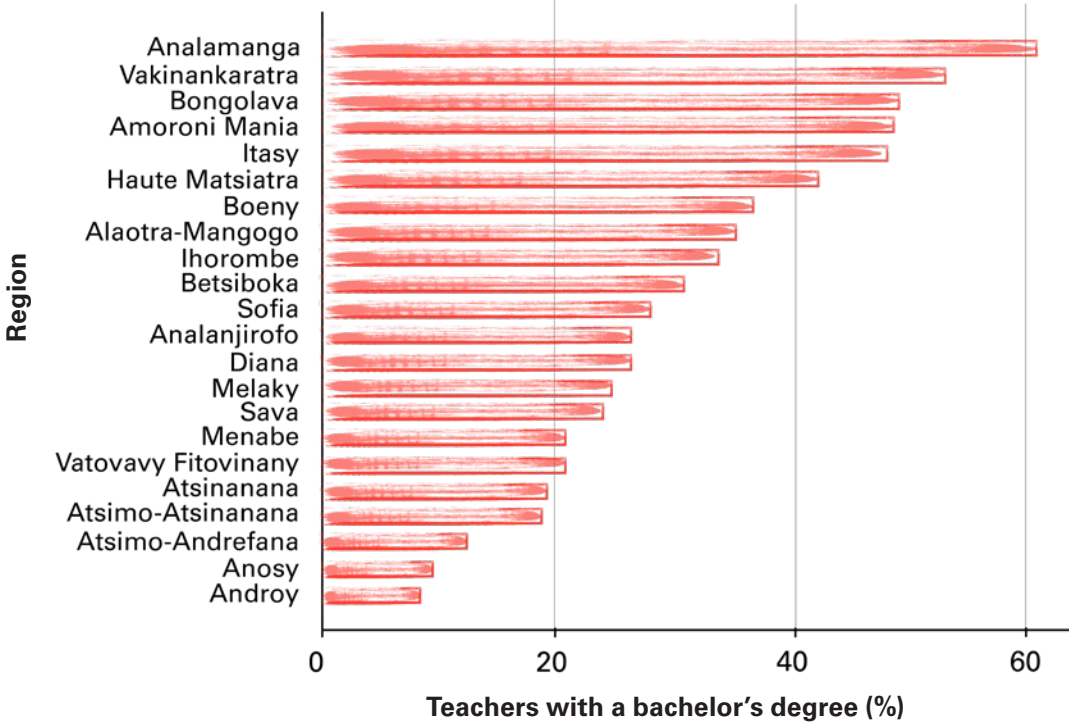

Number of seats per student

Graph A.7: Proportion of female head teachers by region (averages from 2017/18 to 2020/21)

Graph A.8: Proportion of female teachers by region (averages from 2017/18 to 2020/21)

Graph A.9: Percentage of teachers with a bachelor's degree by region (averages from 2017/18 to 2020/21)

Appendix G: Robustness tests

The following alternative models were estimated:

1. First, **sampling weights** were used to take account of the relative size of schools and give more weight to larger schools (size being defined by the number of students). This was intended to address the fact that averages for smaller schools are calculated on the basis of a small number of students, which can lead to significant fluctuations from one year to the next and influence findings.

2. Second, models **excluding staff variables** from the list of explanatory variables were estimated in order to determine whether the findings were similar, given that approximately 15 per cent of schools do not have information on their staff. If these schools had very different characteristics from the other schools, excluding them from the analysis could alter the findings.

3. As a third step, **models based on promotion rates excluding 2019/20** were estimated in order to determine the extent to which findings were affected by the COVID-19 crisis.

4. Finally, models based on **school-level fixed effects** were evaluated to control for unobservable time-fixed factors that might influence the relationship between the explanatory variables and the outcome variable. This makes it possible to consider factors such as students' socioeconomic backgrounds.

While these models have the advantage of controlling for unobservable factors that are fixed in time, they have the disadvantage of making more challenging the individual estimation and interpretation of the coefficients associated with observable variables that are stable over the period, as these are "absorbed" by the fixed effects. Thus, if headteachers and teachers change little over the observed period, the coefficients corresponding to these variables cannot be estimated correctly in the fixed effects model. Nevertheless, this model provides useful information and makes it possible to observe the extent to which the coefficients associated with variables that are expected to vary over time (such as student composition) change once fixed effects are included.

Alternative models 1, 2, and 3 (using sampling weights, excluding staff variables and years with different data trends) produce very similar results to the previously estimated models, despite some modest variations in the magnitude of the estimated coefficients.

In model 4 (school-level fixed effects), the coefficients for the infrastructure and school staff variables are smaller and less frequently statistically significant than the main model. This is because, in the vast majority of schools, these variables do not change much over the period. For variables more likely to vary over time, the findings depend on the outcome variable selected (promotion rate or CEPE scores). In the models based on promotion rates, the conclusions of the main models remained broadly the same. In the models based on CEPE scores, most of the coefficients associated with the variables that are expected to vary over time lost their statistical significance, with the exception of the percentage of female CEPE candidates. The sign of the coefficients associated with the percentage of students repeating a year and with the percentage of children who had attended preschool was reversed after fixed effects were introduced. In summary, the findings from fixed-effects models are more stable for promotion rates than for CEPE success. The findings of the latter model should therefore be interpreted with more caution.

The results of these different robustness tests are available from the authors upon request.

for every child, answers

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