Understanding school management with public data: A new measurement approach and applications

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Abstract

Why do students learn more in some schools than others? One consideration receiving growing attention is school management. To study this, researchers need to be able to measure school management accurately and cheaply at scale. We introduce a new approach to measuring management practices using existing public data and exemplify the methodology with OECD's *PISA* and Brazil's *Prova Brasil*. Both indices show a strong, positive relationship between management and learning. We highlight two example applications: an extension of the Akhtari et al. (2022) analysis of political turnover and student learning, and an exploration of the mechanisms behind the key performance relationship.

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1 Introduction

Despite global calls for improvements in education, progress towards learning for all is slow. This deficit is particularly pronounced for poor children and children in low-income countries (Akmal and Pritchett, 2019; Cullen et al., 2013). But why do some students learn more in some schools than others? While there are many contributing factors at system, school, and household-level, one consideration receiving growing attention is school management — the processes and practices used by principals day-to-day as they run their schools (World Bank, 2018). However, researchers and practitioners interested in this issue face a key challenge in accounting for the role of management practices in their work: how to measure school management accurately and cost-effectively at scale and across contexts.

In this paper, we address this challenge by developing a new approach to measurement that can, in principle, be used with any existing public dataset containing items about school management. We illustrate the methodology with two example datasets: the OECD's Programme for International Student Assessment (PISA) and the Brazilian Prova Brasil assessments and surveys. We then demonstrate the value of the new indices with two example applications: an extension of the findings in Akhtari et al. (2022) and testing of a proposed conceptual framework.

The essence of our approach is to benchmark against the well-established, but expensive, World Management Survey (WMS) for schools developed by Bloom et al. (2015). We show how questions from these public surveys can be classified into management practices measured in the WMS, coded following the spirit of the WMS rubric and built into a school management index. Our PISA-based index covers over 15,000 schools across 65 countries, and our Prova Brasil-based index covers nearly all public schools in Brazil (over 72,000). We supplement these management indices by using questions relating to teacher shortages, motivation and effort, and household engagement, to construct measures of school functioning, both for PISA and Prova Brasil.

Our first application demonstrates how this approach can be used to deepen understanding of variation in student learning. Akhtari et al. (2022) study the public services impact of mayoral elections in 2008 and 2012 in Brazil. Using a regression discontinuity (RD) design based on close elections, they show that political turnover within the governments that run municipal schools lowers student performance. They argue that changes in political leadership trigger changes in school personnel, and that this "upheaval" results in lower student learning. We use our new measurement approach to probe this issue, exploring whether political turnover negatively impacts student test scores via school management. Using the

same methodology and data but including our management index, we find that political turnover leads to a deterioration in school management practices: new school principals appointed by new municipal governments fail to retain the better management practices of their predecessors and/or to implement improvements. This finding has an important policy implication: actions that help to preserve formal practices (e.g., via training and support for incoming principals) could mitigate the "upheaval" and minimize disruption to student learning.

Our second application tackles a related question: why does school management matter for student learning? We develop a theoretical framework that builds out causal pathways from school management to school functioning (how the school functions in terms of teacher recruitment, motivation and effort, and its ability to engage households) and from these intermediate outcomes into student learning. This framework has two key features. The first is an education production function in which student learning depends on teacher effort, teacher ability, and household effort. The second is the impact of management, where we assume that good management practices enable managers to: cultivate the intrinsic motivation of their staff; free up resources to offer a higher level of pay; and build a stimulating environment for students and parents. These modelling choices create three mechanisms that link management to student learning: teacher incentives, teacher selection and household incentives. The behavioural responses in terms of school functioning give us testable predictions to take to the data. We explore these predictions using our indices for PISA and Prova Brasil and find strong empirical support for the causal pathways posited in the theory. These findings should reassure policymakers that management interventions can bring tangible improvements to student learning, and we briefly discuss the types of management practices that might be introduced to drive up the bottom tail of performance in government-run schools.

Our paper contributes to several literatures. Many authors have studied the importance of managers and management practices in establishment performance. Results for firms are consistent: managers and management practices matter for productivity (e.g. Bloom et al., 2019; Bloom and Van Reenen, 2007; Giorcelli, 2019; Scur et al., 2021; Syverson, 2011) and labor flows (Bender et al., 2018; Cornwell et al., 2021). This relationship has also been documented in the public sector, including schools in both high state capacity contexts (Bloom et al., 2015; Fryer, 2014, 2017) and low state capacity contexts (Crawfurd, 2017; Lemos et al., 2021; Romero et al., 2020).[1] To date, however, the number of schools

[1] In addition to schools, sectors studied include: universities (McCormack et al., 2014), healthcare facilities (Bloom et al., 2015, 2019), social programs (Delfgaauw et al., 2011; McConnell et al., 2009), and the civil

and countries studied has been relatively small, primarily as a result of data limitations (Adelman and Lemos, 2021). Our new measurement approach enables researchers to work with substantially larger datasets and, as we illustrate in our first application, facilitates quasi-experimental methods for policy evaluation.[2]

A related literature studies the role of education systems and institutions in determining student performance across countries (Wössmann, 2016). Many papers use PISA data and have looked at this issue through the lens of autonomy (Hanushek et al., 2013; Wössmann et al., 2007), competition (West and Wössmann, 2010), student tracking (Hanushek and Wössmann, 2006; Ruhose and Schwerdt, 2016), external exams (Wössmann, 2005), and instructional time (Lavy, 2015). Our new indices, especially the PISA-based ones, enable researchers to consider school management in such studies and across a larger number of countries.

There is a growing literature in personnel economics exploring incentives and selection in public sector organizations (see Dal Bó and Finan (2020) and Finan et al. (2017) for recent reviews). Lazear (2003), Dohmen and Falk (2010) and Leaver et al. (2021) emphasise the potential selection margin of teacher performance pay. A selection margin also features in the dynamic occupational model of Rothstein (2015) and the Roy model of Biasi (2021). Our contribution in this paper is to focus on other aspects of school management (rather than performance pay) and to provide an intuitive decomposition of the impact of these practices on student learning.

2 How to measure management in schools?

Until the early 2000s, management was typically viewed as an un-measurable productivity shifter, relegated to the residual in performance regressions (Bloom and Van Reenen, 2007). Since then, improvements in survey methodology and data access have allowed for substantial advances in measurement. Currently, the leading approach uses a dedicated survey — the World Management Survey — to measure establishments' adoption of structured management practices. While the WMS offers uniquely rich information about management practices, it costs approximately USD400 per interview and takes about 4 months to conduct a single country wave. In view of these costs, it may not be well-suited to every context (Scur et al., 2021).

service (Fenizia, 2022; Rasul and Rogger, 2016).

[2] A further benefit is that researchers using experimental methods now have a larger set of "benchmarkable" questions on management practices to consider for inclusion in baseline and endline surveys.

We propose an alternative approach that can, in principle, be used with any existing public dataset containing information on management practices. We start with the WMS as a benchmark, and identify the set of questions in the public survey that elicit information on the management practices that are also measured in the WMS. We then code answers in line with the WMS scoring methodology — that is, more structured practices are assigned higher scores — and build a set of indices from these individual question scores. We use this approach to build a management index that we then benchmark to the WMS, and also to build new indices that measure principal perceptions of teacher shortages, teacher motivation, teacher effort and household effort. The latter are new indices and thus have no equivalent in the WMS. We illustrate this approach with questionnaires and data from both a global dataset, PISA, and a national dataset, Prova Brasil. Since Brazil and several other PISA countries are part of the Bloom et al. (2015) sample, we can compare the (within-country) distribution of each index with the corresponding (within-country) distribution of the WMS index. As we show below, our indices are well-validated and can therefore be used by researchers interested in studying management across a wider range of countries and schools than was previously possible.

2.1 Measuring Management: collecting data with the WMS method

The WMS was developed to measure adoption of structured management best practices in establishments across a range of countries and industries (WMS, 2021).[3] The rigorous data collection is based on double-blind, semi-structured interviews conducted by highly-trained analysts and monitored by supervisors experienced on the survey methodology. Following its successful implementation in the private sector, the WMS was subsequently extended to public sector organizations (Bloom et al., 2015, 2019); in this paper, we focus on the latter.

The public-sector WMS covers 20 topics across two main areas: *operations management* and *people management*. Broadly speaking, operations management in schools covers practices including: whether the school has standardization of instructional processes across classrooms while allowing for within-classroom personalization of learning; whether and how the school uses assessments and data; and whether and how the school sets and uses targets and keeps track of progress. People management covers practices in handling good and bad performance, measuring whether there is a systematic approach to identifying good and bad performance, rewarding school teachers proportionately, dealing with underperformers, and promoting and retaining good performers.

[3]See Bloom and Van Reenen (2007) for the survey's inception and Scur et al. (2021) for a recent review with a focus on policy implications.

For each WMS topic, there is a scoring grid ranging from 1 (little to no structured management) to 5 (best practice), which serves as a guide to evaluate answers to questions during the interviews. The overall management index, which measures the level of adoption of structured management best practices, is simply the average of the scores for these 20 topics. The practices measured by the survey seem to matter: Bloom et al. (2015) show that their school management score is strongly positively correlated with school-level student outcomes across 6 countries (Brazil, Canada, India, Sweden, UK and US). They find a strong positive correlation for these countries: moving from the bottom to the top quartile of management is associated with a large increase in student learning outcomes, equivalent to approximately 0.4 standard deviations.

2.2 Measuring Management: a new approach using existing public data

Our main approach entails constructing indices based on the set of basic management topics that have a benchmark equivalent in the WMS. We illustrate the methodology using PISA and Prova Brasil. We primarily use principal questionnaires but include information from other questionnaires (teachers, parents, student) if they relate to the practice in question. Full details to enable replication with these (and alternative) data sources are provided in the Online Appendix.

2.2.1 Construction of indices

PISA PISA's principal survey includes a wide-range of questions that measure the management practices used within the school, as well as the principal's assessment of how the school is functioning (OECD, 2021). We focus on the 2012 survey wave across 65 countries since it contains a particularly rich set of questions, especially relating to people management.[4] We identify 53 PISA questions that can be classified into 14 management practices measured in the WMS and assign scores for each question following the spirit of the "crosswalk" between the WMS and the self-respondent US Census Management and Organizational

[4]PISA 2015 has a smaller number of questions relative to the 2012 questionnaire. In particular, a number of the questions we used to measure people management with the 2012 data are not included in 2015. Many of these questions were moved to the *voluntary* teacher questionnaire, preventing us from building an identically rich index across both years. Thus, we focus on the richer 2012 data. Our index is distinct from the "leadership and management" measure from 2012 PISA. The PISA-built index is based off a section of the questionnaire that was titled *management* and contained only a narrow subset of questions. This PISA measure does not compare well to the (empirically robust) management index derived from the World Management Survey (see Liberto et al. (2015)).

Practices Survey (MOPS).[5] We average the scores within each of the 14 topics, and build our management index using the same approach as the WMS — standardizing each topic score using within-country distributions, then taking the simple average and standardizing again.[6] Next, we use the questions relating to school functioning to construct four further indices. Here, we identify: 4 questions that ask whether the school's capacity to provide instruction is hindered by a shortage of teachers to create a *teacher shortage* index; 14 questions that ask about teacher morale and work attitudes to create a *teacher motivation* index; 3 questions that measure teacher absenteeism and punctuality to create a *teacher effort* index; and 19 questions that ask about student commitment and parental involvement to create a *household effort* index.

Prova Brasil is a national census-like student assessment and survey of school principals, teachers, and students that has near universal coverage in Brazil's public education sector across multiple years (INEP, 2021).[7] We focus on the six biennial survey waves running from 2007-2017. We follow the steps outlined above for PISA to create five Prova Brasil-based indices. To construct the management index, we classify 29 questions (19 from the school principal questionnaire and 10 from the teacher questionnaire) into 5 WMS topics, and code responses following the same methodology and logic as we described for PISA. The questions that we use to construct the teacher shortage (4 questions), teacher motivation (5 questions), teacher effort (3 questions) and household effort (6 questions) indices are drawn from the principal, teacher and student questionnaires, as described in the Online Appendix.

2.2.2 Pros and cons

The public datasets described above have different strengths: PISA provides a global view and includes a sample of both public and private schools, while Prova Brasil provides far greater coverage of the public sector and contains school identifiers to enable matching with external datasets (as we will exploit below). Both, however, share the downside that the data are self-reported.

One concern with self-reported data is measurement equivalence. To address potential

[5] Our approach follows the spirit of the re-casting of the original phone-based WMS into the MOPS administered to the population of US manufacturing establishments as a self-reported questionnaire (Bloom et al., 2019). The MOPS has been replicated in a number of other countries. Its questions follow the WMS topics and look to measure similar practices, but with self-reported answers.

[6] As a robustness check, Appendix B provides results for alternative index building approaches including principal component analysis and the Anderson (2008) index.

[7] Many countries conduct similar national surveys in addition to administering standardized tests across grades. Latin America is particularly prolific: in addition to Brazil's Prova Brasil, Colombia's SABER, Chile's SIMCE, and Peru's ECE are all available to researchers.

measurement error driven by cross-cultural understandings and norms in answering questions, we standardize our PISA-based management index *within countries*. This has an important implication: since all 65 countries have a mean score of zero, our index cannot be used to construct cross-country rankings of school management. Instead, the value of our PISA-based index lies in enabling academics and practitioners to study the (within-country) relationship between management and other variables for a far wider set of countries than was previously possible. This issue of cross-cultural norms is less of a concern for our Prova Brasil-based index since it is, by construction, within-country.

Another concern with self-reported data is that it is difficult to assess whether respondents are being accurate and truthful. The WMS methodology includes strategies to elicit truthful information during the interview (such as always asking open-ended questions and asking for examples), but these are not available in self-reported questionnaires. We address this issue by focusing on the topics that have a direct equivalent in the WMS to allow for a clear validation process.

2.2.3 Validation of new management indices

We conduct two validation exercises for our new management indices: for PISA, as there are no identifiers, we compare the distribution of scores and the performance correlations for the common countries. For Prova Brasil, we use school identifiers to match schools directly and provide a one-to-one comparison of the index values.

PISA Figure 1a reports the distributions of our PISA-based management index (solid red line) alongside the distribution of the WMS management index (dashed black line), for all countries appearing in both datasets. The PISA and WMS distributions are reassuringly similar. The Kolmogorov-Smirnov test for equality of distributions rejects in only one of the 9 cases, Italy, where the PISA-index is somewhat more dispersed.

In Figure 1b we conduct a basic check of the correlation between our management index and a key outcome variable of interest: student learning outcomes. For each country, we separate schools into quartiles of the management measure and show, for each quartile, the average PISA test scores for math, reading and science (in deviations from the global mean). The graph includes all students and schools across the 65 countries available in the 2012 PISA dataset. This figure shows that students in schools in the bottom quartile of (within-country) management score are, on average, performing about 6 points lower than the PISA global mean. In contrast, students in schools in the top quartile of (within-country) management score are, on average, performing about 5.5 points higher than the PISA global

mean. To put this into context, 40 PISA points are the equivalent of an average year of learning.[8] The range of our results mirror how much, for example, the UK average science score changed between 2009 and 2015 (5 points), and how much the Brazilian average science score decreased over the same period (4 points).

In Table 1 we formalize these relationships by reporting the average correlations between our PISA-based management index and student test scores in reading (Columns 1 to 3), math (Columns 4 to 6) and science (Columns 7 to 9).[9] We report the standard errors in parentheses and p-values in square brackets. The standard errors are clustered at the school level and use the appropriate survey weights.[10] In these PISA specifications, we include country fixed effects, and successively introduce school controls (a dummy for private school, dummies for school location, student-teacher ratio, log of the number of students, ratio of computers connected to the web used as a proxy for school resources, and share of government funding relative to total funding the school receives) and then student controls (gender, grade, socio-economic status and immigration status). The top panel includes all schools, and the bottom panel includes schools in Brazil for comparison with the Prova Brasil data. Sample sizes (of the number of students and schools) and the R-squared are reported within each panel.

Column (1) shows the raw relationship between the PISA-based school management index and student performance, only controlling for country fixed effects. The coefficient for all 65 countries is 3.785 points, and for Brazil is 7.483 points. PISA is standardized across years and countries such that the mean is 500 and the standard deviation is 100. As 40 points on the PISA scale is equivalent to one year of learning, the correlation in Column (1) in the top panel indicates a one standard deviation increase on our management index is associated with higher PISA reading test score points equivalent to about one month's worth of learning. For Brazil, this is equivalent to almost two months. Columns (4) and (7) report similar relationships for math and science scores. Columns (2), (5) and (8) include school controls, which absorb some of the variation, and Columns (3), (6) and (9) report the fully-specified regression with student controls. Including school and student controls substantially reduces most of the coefficients, but (in the top panel, for all schools) the correlations remain significant and economically important.

[8] See OECD (2019), "How PISA results are reported: What is a PISA score?", in PISA 2018 Results (Volume I): What Students Know and Can Do, OECD Publishing, Paris

[9] For these estimates, we use the student-level PISA 2012 dataset and the OECD's `repest` Stata command, which uses the five available test score plausible values for each student and subject.

[10] See Jerrim et al. (2017) for a thorough review of how to best use PISA scores and survey weights.

Prova Brasil Unlike PISA, the Prova Brasil dataset includes school identifiers that allow for a one-to-one match with the schools surveyed for the WMS. We are able to match 273 schools in the 2013 waves of both surveys. Figure 2a shows a binned scatter plot of the WMS management score against the standardized Prova Brasil-based management score for these 273 schools across the same set of questions. Each circle represents the average of 5 schools. There is a positive and significant correlation of 0.23, suggesting reasonable internal validation of the Prova Brasil index. In Figure 2b, we show the average scores of students for math and language (here, Portuguese) across quartiles of management score, focusing on Grade 9 in 2013 to maintain comparability with Figure 1b for PISA. This exercise confirms that the pattern we see across the world in the PISA data also holds in Brazil, with this completely different dataset.

In Table 2 we formalize these relationships by reporting the average correlations between our Prova Brasil-based management index and student scores in Portuguese (Columns 1 to 5) and math (Columns 6 to 10). We use the student-level dataset between 2007 and 2017 (6 rounds), for both grades 5 and 9, and run standard OLS regressions clustering standard errors at the school level. We use the standardized management index and standardized scores for Portuguese and math. Columns (1) and (2) add year and state fixed effects, respectively. Column (3) adds the set of controls that matches those found in the PISA dataset (school controls: dummies for school location, student-teacher ratio, log of the number of students, and dummies for a computer lab and for internet access; student controls: gender, socio-economic status, and race). Column (4) includes additional controls available in the Prova Brasil data (school controls: dummies for principal age, education, race, and other employment, share of male teachers, white teachers, and teachers holding a college degree, average teacher tenure; student control: dummies for mother's education). Finally, Column (5) adds school fixed effects (and drops state fixed effects), which allows us to compare school changes in learning results with their changes in management practices. In this more demanding specification, the coefficient suggests that one standard deviation higher management score is associated with a 0.02 standard deviation higher score in both Portuguese and Math.[11]

We have shown that both our PISA-based and Prova Brasil-based management indices are well-validated, both in terms of 'fit' to the WMS distribution (for overlapping countries or schools) and their correlation with student learning outcomes. In the next section, we

[11] When exploring the longitudinal dimension of the WMS data across multiple countries and adding firm fixed effects to their management-productivity regressions, Bloom et al. (2012) also find a weaker relationship. Their coefficient is 0.047 standard deviation higher productivity.

illustrate how these new indices can be used in two example applications.

3 Applications

There are myriad uses of these new indices. In this section, we provide two applications, exploring the relationship between: political turnover and the quality of school management practices, and then school management practices, school functioning, and student learning.

3.1 Political turnover and the quality of school management

Akhtari et al. (2022) study mayoral elections in 2008 and 2012 in Brazil and find that when cities get a new government there is an "upheaval" in the municipal bureaucracy, including school principals. They note that there is an "increase in the replacement rate of personnel in schools controlled by the municipal government" and that this is accompanied by "test scores that are 0.05 to 0.08 standard deviations lower. In contrast, turnover of the mayor's party does not impact local (non-municipal) schools." They argue that changes in political leadership trigger changes in school personnel (both school principals and teachers) which, in turn, negatively affect test scores. We use our Prova Brasil-based management index to further explore this result. Specifically, we ask: does political turnover negatively impact student test scores *through a school management channel*?

To do this, we merge our Prova Brasil management index into the Akhtari et al. (2022) replication dataset (Moreira et al., 2021). Figure 3 replicates the main regression discontinuity design graphs but with our management index as the outcome variable instead of student test scores.[12] In Panel (a), we plot the incumbent vote margin in the 2008 and 2012 mayoral elections against the subsequent quality of management practices (in 2009 and 2013) in schools that are run by the municipal government. There is a clear discontinuity; the subsequent quality of management practices in municipal schools is *lower* in cities where the incumbent mayor narrowly loses an election than in cities where the incumbent mayor narrowly wins. Panel (b) shows that this discontinuity is not present in non-municipal schools run by the state (rather than municipal) government. This is an important placebo test since these schools could not have been subject to "upheaval" associated with political turnover at the municipality level.

Akhtari et al. (2022) argue that changes in political leadership trigger changes in school

[12]Figure A.1 replicates the original RD graph from Akhtari et al. (2022) with test scores as the outcome variable.

personnel, and that this translates into lower test scores. But what if school principals are not replaced? Then we should see no post-election decline in management scores and, if management is a key mechanism, a smaller impact on test scores. Panel (c) confirms that, for the sub-sample of municipal schools where the mayor (new or otherwise) did not replace the school principal after the election, there is no discontinuity. The subsequent quality of management practices in municipal schools is the same in cities where the incumbent narrowly loses an election and *the incoming mayor does not replace the school principal* as in cities where the incumbent narrowly wins an election and does not replace the school principal. Panel (d), in turn, confirms that, for this sub-sample of municipal schools with no school principal replacement, there is no statistically significant discontinuity in test scores.

Table 3 shows the associated regression analysis. The dependent variable is the quality of school management practices in the year after the election. Following Akhtari et al. (2022), the running variable of the RD is the incumbent vote margin (computed as the vote share of the incumbent political party minus the vote share of the incumbent party's strongest opponent). The treatment variable is $\mathbf{1}\{IncumbVoteMargin < 0\}$, which is an indicator variable equal to one if the incumbent political party lost the election (and hence the municipality experienced political party turnover) and zero otherwise.[13] Panel A reports results for municipal schools, Panel B results for non-municipal schools, and Panel C results for the sub-sample of schools with no school principal replacement (the principal reports being in post in their current school for at least two years on the Prova Brasil school principal questionnaire). Columns (1) and (2) use the optimal bandwidth, first without controls and then including the same controls as in Akhtari et al. (2022). Columns (3)-(6) repeat this exercise using the bandwidths in Akhtari et al. (2022). In Panel A, in every specification, there is a negative and strongly significant coefficient on the dummy variable indicating mayoral turnover. The management index is between 2 and 3 percentage points lower in a school that is controlled by a newly formed municipal government than in a school that is controlled by a government that has not been subject to such upheaval. By contrast, in Panels B and C, the coefficient on the dummy variable indicating mayoral turnover is positive and never significant.[14]

The results in Figure 3 and Table 3 show a simple, but powerful, application of our measurement approach. We took existing public data from Prova Brasil and linked them to data in the American Economic Review replication archives. With no further survey costs,

[13] All specifications include the quality of school management practices in the year prior to the election as a baseline control, as well as an interaction between the running variable and the treatment variable.

[14] Table A.1 repeats the regression analysis with test scores at the dependent variable, confirming the discontinuity in Figure A.1 and the absence of a discontinuity in Figure 3 Panel (d).

we were able to extend the analysis in Akhtari et al. (2022) to explore further mechanisms around how political turnover affects student learning outcomes. Our findings suggest that one channel is a deterioration in the quality of school management practices: new school principals appointed by new municipal governments fail to retain the better management practices of their predecessors and/or to implement improvements. This highlights the potential importance of offering management training and support to new school heads.

3.2 School management practices, school functioning, and student learning

It is now well established that good management practices in schools are associated with better student learning outcomes (c.f. the discussion in Section 2). In this second application, we use our new management indices, together with our indices of school functioning, to explore why this positive relationship exists so consistently across contexts. To do this, we develop a simple theoretical framework in which good management practices drive student learning by improving school functioning, and then take the predictions of this model to the PISA and Prova Brasil data.

The framework focuses on teachers. Our aim is not to provide a theoretical contribution *per se*, but rather to formalize intuitions around teacher incentive and selection mechanisms and their relationship to management practices and student performance.[15] We take wider system-level factors — in particular hiring and firing autonomy, admissions autonomy and competition between schools — as given and assume that teachers and students make choices within the confines of this environment.

Real-world education systems are diverse, particularly in terms of the type of private sector offerings. In some contexts, private schools target affluent households, and jobs in private schools are seen as more attractive than jobs in public schools, typically providing some form of performance-based compensation. In other contexts, there has been a growth of 'low-cost' private schools that deliberately cater for the lower end of the income distribution and, in these settings, jobs in the public sector often confer significant rents relative to the private sector. In view of this diversity, we restrict our analysis to the sector that attends to the largest share of students across countries, namely public schools.

[15] In this sense, we build on the model sketched in the appendix to Leaver et al. (2021).

3.2.1 Theoretical framework

We focus on a teacher who must decide whether to accept a job offer in her assigned public school, or decline it and apply to a private school or the outside sector.

The teacher is risk neutral and cares about her compensation w and effort e. When working in the education sector, the teacher's preferences are $w - (e^2 - c\,e)$. The parameter c captures her *intrinsic motivation*. This is because for $e < c/2$ she derives a marginal benefit from exerting an extra unit of effort in teaching; it is only when $e > c/2$ that effort costs kick in. We assume that $c = \tau + \Delta$. The first component τ denotes the teacher's baseline intrinsic motivation. This can be thought of as the realization of a random variable. The teacher observes this realization perfectly, while (at the time of hiring) employers observe nothing. The second component Δ is a motivational increment that, as we describe below, is determined by the management practices in the teacher's chosen school. When working in the other sector, the teacher's preferences are simply $w - e^2$; intrinsic motivation plays no role. We abstract from student heterogeneity and focus on a representative household (student plus parents). This household cares only about its effort level a, and has preferences $-(a^2 - \gamma\ a)$. The parameter γ is a motivational increment that is also determined by management practices.

Let y_1 denote a representative student's learning outcome in a school that hires the teacher, and y_0 denote a representative student's learning outcome in a school that does not hire the teacher. To the extent that teachers contribute to learning, one would expect $y_1 > y_0$. We capture this in a simple way by assuming $y_1 = \theta e + a + \varepsilon$ and $y_0 = a + \varepsilon$. If the teacher is not hired by a school but instead chooses to work in the outside sector, her performance is $z = \theta e + \varepsilon$. The component θ denotes the teacher's *ability*. This can also be thought of as the realization of a random variable, assumed to be independent of τ. The teacher observes this realization perfectly, while (at the time of hiring) employers observe nothing. Draws of the error term ε are independent across employments. We assume throughout that ε is mean zero and distributed $U\,[\underline{\varepsilon}, \overline{\varepsilon}]$.

Public schools offer a wage of G. Private schools offer a base wage of W plus a bonus B if the teacher's performance exceeds a threshold $\bar{y}$. The outside sector offers a low base wage (normalized to zero) and a bonus β if performance exceeds a threshold $\bar{z}$.

We assume that management has three effects. The first relates to teacher motivation: good management practices enable managers to cultivate the intrinsic motivation of their staff, increasing Δ. The second relates to compensation: good management practices free up resources and enable managers to offer a higher level of pay (potentially in hedonic form). The third relates to household effort: good management practices help to create a stimulating

environment for students and parents, increasing γ. Our interest lies in establishing how these three effects translate into student learning. We do not model the government's assignment rule, or the school principal's choice of management practices. For simplicity, we classify schools as either high or low management. In a high management school, Δ, base pay, and γ are all higher than in a low management school. Below is a summary of this description of the model.

1. Nature chooses the teacher's two-dimensional type. This realization (τ, θ) is observed by the teacher but not by employers.

2. Employers announce management practices and compensation schemes.

3. The teacher is assigned (by government) to a public school and decides whether to accept this post or decline it and apply either to a private school or the outside sector.

4. Having made an occupational choice, the teacher chooses an effort level. Simultaneously, if the teacher is in the education sector, households choose effort levels.

5. A performance metric is realized. The teacher is rewarded in accordance with the compensation scheme announced at Stage 2.

3.3 Mechanisms

We use this framework to show how public schools with good management can produce better student outcomes. Specifically, we compare outcomes in a high management public school with outcomes in a low management public school, assuming both compete with a high management private school and the outside sector. The index $i = L, H$ denotes the quality of management in these public schools.

Public school i hires its assigned teacher if, given her (θ, τ) type, she expects to receive a higher payoff from teaching in this school compared to a high management private school or working in the outside sector. We use the notation $\mathcal{T}^i$ to denote the set of (θ, τ) types that can be hired to this school. The expected learning outcome of a representative student (*ex ante*, prior to occupational and effort choices) is

$$\mathrm{E}\left[y^i\right] = \mathrm{E}\left[y_1^i \cdot 1_{\{(\theta,\tau)\in\mathcal{T}^i\}}\right] + \mathrm{E}\left[y_0^i \cdot 1_{\{[(\theta,\tau)\notin\mathcal{T}^i\}}\right],$$

where $1_{\{(\theta,\tau)\in\mathcal{T}^i\}}$ and $1_{\{[(\theta,\tau)\notin\mathcal{T}^i\}}$ are indicator functions for the hiring and not hiring events. In keeping with the empirical application, we will refer to $\mathrm{E}\left[y^i\right]$ as the expected test score in school i.

The difference in expected test scores between high and low management public schools can be written as

$$\begin{aligned}\mathrm{E}\left[y^H\right] - &\mathrm{E}\left[y^L\right] = \\ &\mathrm{E}\left[y_1^H \cdot 1_{\{(\theta,\tau)\in\mathcal{T}^H\}}\right] - \mathrm{E}\left[y_1^L \cdot 1_{(\theta,\tau)\in\mathcal{T}^L\}}\right] + \mathrm{E}\left[y_0^H \cdot 1_{\{(\theta,\tau)\notin\mathcal{T}^H\}}\right] - \mathrm{E}\left[y_0^L \cdot 1_{\{(\theta,\tau,)\notin\mathcal{T}^L\}}\right].\end{aligned}$$

In the Appendix, we derive teacher and household effort in high and low management public schools. These optimal choices are $e^i = \frac{\tau+\Delta^i}{2}$ and $a^i = \frac{\gamma^i}{2}$ for $i = L, H$. Substituting for these expressions, we can decompose the difference in expected test scores as

$$\begin{aligned}\mathrm{E}\left[y^H\right] - \mathrm{E}\left[y^L\right] = &\underbrace{\mathrm{E}\left[\theta\left(\frac{\Delta^H - \Delta^L}{2}\right)\cdot 1_{\{(\theta,\tau)\in\mathcal{T}^H\}}\right]}_{\text{teacher incentives}} + \\ &\underbrace{\mathrm{E}\left[\theta\left(\frac{\tau+\Delta^L}{2}\right)\cdot\left(1_{\{(\theta,\tau)\in\mathcal{T}^H\}} - 1_{\{(\theta,\tau)\in\mathcal{T}^L\}}\right)\right]}_{\text{teacher selection}} + \underbrace{\frac{\gamma^H - \gamma^L}{2}}_{\text{household incentives}}. \qquad (1)\end{aligned}$$

The first term on the RHS of equation (1) is what we term the *teacher incentive effect* of good management. Here, we compare the expected teacher contribution to the test score outcome in a high management public school, in the event that the teacher is hired to such a school, against the expected teacher contribution in a low management public school, in the counterfactual event that the teacher is hired to a high management public school. In this way, we hold the set of (θ, τ) types fixed and just consider how the incentive environment for the teacher contributes to test scores. This expression shows that the test score is higher in a high management public school, in part, because good management practices increase the intrinsic motivation of any given (θ, τ) type of teacher, who then exerts more effort than she would in a low management public school.

The second term in equation (1) captures what we term the *teacher selection effect* of good management practices. Here, we compare the expected teacher contribution to the test score outcome in a low management public school, in the event that the teacher is hired to such a school, against the expected teacher contribution in a low management public school, in the counterfactual event that the teacher is hired to a high management school. The test score is higher in a high management public school, in part, because good management practices encourage better (θ, τ) types to select in, and these types exert more effort and are of greater ability than would be the case in a low management school.

Figure 4 provides an illustration of this teacher selection effect.[16] The unshaded area in the top panel depicts the set of (θ, τ) types that are hired by a high management public school, while the unshaded area in the bottom panel depicts the set of (θ, τ) types that are hired by a low management public school. Note that the high management public school hires *more* types than the low management public school: the unshaded area is larger in the top panel relative to the bottom panel. It also hires *better* types: average θ and average τ, shown by the (x, y) coordinates of the blue dot, are higher relative to the bottom panel.[17] The third term in equation (1) captures what we term the *household incentive effect* of good management practices. We see from this expression that the test score is higher in a high management public school, in part, because good management practices increase the motivation of parents and students who then exert more effort than they would in a low management public school.

3.4 Predictions and evidence from PISA and Prova Brasil

Our theoretical framework proposes three mechanisms — teacher incentives, teacher selection and household incentives — that could explain the positive correlation between management scores and student learning outcomes apparent in the WMS, PISA and Prova Brasil data. If these mechanisms are correct, then we should see behavioural responses in school functioning. Below, we set out these predictions and explore whether they hold empirically using our PISA and Prova Brasil-based indices.

Teacher shortages The theoretical framework predicts that the probability of hiring the teacher in a high management public school is higher than the probability of hiring the teacher in a low management public school (via teacher selection). Table 4 explores this empirically for the PISA and Prova Brasil data for public schools. In Column (1) and (2), the dependent variable is the teacher shortage index and the explanatory variable of interest is the school management index. In both panels, these indices are standardised within-country. In Panel A, for PISA, Column (1) includes only country fixed effects. Column (2) adds school and student controls. Consistent with the theoretical prediction, there is a

[16] Details of the construction of Figure 4 are provided in the Appendix. Bonus pay in the private education sector and in the outside sector is assumed to be higher than the public sector wage. In the Appendix, we also consider the case where public sector pay exceeds pay in the private education sector (so called 'low-cost' private schools).

[17] As we discuss in the Appendix, the prediction that the high management school hires better θ types is sensitive to parameter assumptions and, for instance, does not hold in our numerical example with 'low-cost' private schools.

negative relationship: a one standard deviation increase in the school management index is associated with a 0.06 standard deviation decrease in the teacher shortage index. In Panel B, for Prova Brasil, Column (1) includes only year effects. Column (2) adds PISA-like controls, additional Prova Brasil controls, and school fixed effects. Again, there is a negative relationship: a one standard deviation increase in the school management index is associated with a 0.09 standard deviation decrease in the teacher shortage index.

Teacher motivation The theoretical framework predicts that the expected intrinsic motivation of a teacher hired to a high management public school is higher than the expected intrinsic motivation of a teacher hired to a low management public school (via teacher selection), at least in settings without low-cost private schools. Column (3) and (4) in Table 4 report regression coefficients on the school management index with the teacher motivation index as the dependent variable. As predicted, there is a positive relationship in both panels. In Panel A, for PISA, a one standard deviation increase in the school management index is associated with a 0.33 standard deviation increase in the teacher motivation index. In Panel B, for Prova Brasil, a one standard deviation increase in the school management index is associated with a 0.22 standard deviation increase in the teacher motivation index.

Teacher effort The prediction here is that the expected effort level of a teacher hired to a high management public school is higher than the expected effort level of a teacher hired to a low management public school (via teacher selection and incentives). Column (5) and (6) in Table 4 report regression coefficients on the school management index with the teacher effort index as the dependent variable. Again, there is a positive relationship. In Panel A, for PISA, a one standard deviation increase in the school management index is associated with a 0.07 standard deviation increase in the teacher effort index. In Panel B, for Prova Brasil, a one standard deviation increase in the school management index is associated with a 0.06 standard deviation increase in the teacher effort index.

Household effort The final prediction is that expected household effort in a high management public school is higher than expected household effort in a low management public school (via household incentives). Column (7) and (8) in Table 4 report regression coefficients on the school management index with the household effort index as the dependent variable. Once again there is a positive relationship. In Panel A, for PISA, a one standard deviation increase in the school management index is associated with a 0.28 standard deviation increase in the household effort index. In Panel B, for Prova Brasil, a one stan-

dard deviation increase in the school management index is associated with a 0.06 standard deviation increase in the household effort index.

These findings suggest that the causal pathways from the quality of management practices to student learning posited in the theory — selection and incentives within and beyond the school — are empirically plausible across a wide range of countries. Given such pathways, policymakers should feel reassured that interventions targeting the quality of management will bring dividends in terms of student learning. The within-country variation in the quality of management practices apparent in our data indicates that there is substantial scope to drive up the bottom tail in government-run schools. People management practices such as performance pay, while common in the private sector, may not be possible in public schools. But there would seem to be fewer barriers to conducting assessments to judge teacher effectiveness, and letting such appraisals lead to changes in public recognition, opportunities for professional development, likelihood of career advancement, and/or greater responsibilities. Our analysis also suggests a role for policymakers to encourage principals in public schools with weak operations management to follow best practice. Specific areas include processes that facilitate: personalization of learning; dialogue among staff, students and parents focused on continuous improvement; and collection and use of student assessment data.

4 Conclusion

Policy makers have begun to set ambitious, universal learning goals. To achieve these targets it will be necessary to understand why — within and across current education systems — some students are learning more in some schools than others. Although there are likely many factors at work, at least part of this variation in learning stems from the management of schools. To explore this issue and develop policy, researchers and practitioners need to be able to measure school management accurately and cost-effectively at scale across schools and countries, and be in a position to postulate mechanisms behind any observed relationship between school management and student learning.

The key contribution of this paper is the development of a new approach to measurement at scale using existing public data sources. It is striking that both of our new school management indices confirm the strong positive correlation of school management scores with school-level student outcomes first reported in Bloom et al. (2015). We provide two examples of applications using this measurement approach. The first application highlights opportunities to deepen existing research by exploring the role of school management as a potential mechanism. In extending Akhtari et al. (2022), we show that the drop in student learning

following a change in school leadership is likely linked to the destruction of organizational capital: when principals leave, *actual practices* at the school also cease to be carried out. An important implication from this finding is that actions that preserve *formal practices* could mitigate the "upheaval" and minimize disruption to student learning. The second application example shows how these new indices can be used to explore why management structures might impact student learning. We find strong support for the causal pathways posited in our theoretical framework — selection and incentives within and beyond the school — and discuss policy implications, including targeted management interventions.

To sum up, our indices are well-validated and can be used by researchers interested in studying the role of management in education systems across a far wider range of countries and schools than was previously possible. The two application examples we outline help illustrate that our measurement approach is cheap and easy to use at scale and can deliver new results with policy insights. Our finding that political turnover in Brazilian municipal governments negatively impacts student test scores, *inter alia*, via a school management channel highlights the importance of offering management training and support to new school heads. The empirical support for causal pathways from good management practices to student test scores suggests targeted interventions to poorly-managed public schools could yield significant learning gains. Investigating *how* to implement strong people and operations management practices to drive learning for all is an important area for future research.

References

Adelman, M. and R. Lemos (2021). *Managing for Learning: Measuring and Strengthening Education Management in Latin America and the Caribbean*. International Development in Focus. Washington, DC: World Bank.

Akhtari, M., D. Moreira, and L. Trucco (2022, February). Political Turnover, Bureaucratic Turnover, and the Quality of Public Services. *American Economic Review 112*(2), 442–93.

Akmal, M. and L. Pritchett (2019). Learning equity requires more than equality: Learning goals and achievement gaps between the rich and the poor in five developing countries. Working Paper 19/028, RISE.

Anderson, M. L. (2008). Multiple inference and gender differences in the effects of early intervention: A reevaluation of the abecedarian, perry preschool, and early training projects. *Journal of the American Statistical Association 103*(484), 1481–1495.

Bender, S., N. Bloom, D. Card, J. Van Reenen, and S. Wolter (2018). Management practices, workforce selection, and productivity. *Journal of Labor Economics 36*(S1), S371–S409.

Biasi, B. (2021, August). The labour market for teachers under different pay schemes. *American Economic Journal: Economic Policy 13*(3), 63–102.

Bloom, N., E. Brynjolfsson, L. Foster, R. Jarmin, M. Patnaik, I. Saporta-Eksten, and J. Van Reenen (2019, May). What drives differences in management practices? *American Economic Review 109*(5), 1648–83.

Bloom, N., C. Genakos, R. Sadun, and J. Van Reenen (2012). Management practices across firms and countries. *Academy of Management Perspectives 26*(1), 12–33.

Bloom, N., R. Lemos, R. Sadun, and J. Van Reenen (2015, May). Does management matter in schools? *The Economic Journal 125*, 647–674.

Bloom, N., C. Propper, S. Seiler, and J. V. Reenen (2015). The impact of competition on management quality: Evidence from public hospitals. *Review of Economic Studies 82*(2), 457–489.

Bloom, N., R. Sadun, R. Lemos, and J. V. Reenen (2019). Healthy business? Managerial education and management in healthcare. *The Review of Economics and Statistics 0*(ja), 1–45.

Bloom, N. and J. Van Reenen (2007). Measuring and explaining management practices across firms and countries. *The Quarterly Journal of Economics 122*, 1351–1408.

Cornwell, C., I. Schmutte, and D. Scur (2021). Building a productive workforce: the role of structured management practices. *Management Science 67*(12).

Crawfurd, L. (2017, 08). School Management and PublicPrivate Partnerships in Uganda. *Journal of African Economies 26*(5), 539–560.

Cullen, J. B., S. D. Levitt, E. Robertson, and S. Sadoff (2013, May). What can be done to improve struggling high schools? *Journal of Economic Perspectives 27*(2), 133–52.

Dal Bó, E. and F. Finan (2020). At the intersection: A review of institutions in economic development. In J.-M. Baland, F. Bourguignon, J.-P. Platteau, and T. Verdier (Eds.), *The Handbook of Economic Development and Institutions*, Chapter 1. Princeton and Oxford: Princeton University Press.

Delfgaauw, J., R. Dur, C. Propper, and S. Smith (2011, 07). Management practices: Are not for profits different? *SSRN Electronic Journal*.

Dohmen, T. and A. Falk (2010, May). You get what you pay for: Incentives and selection in the education system. *The Economic Journal 120*, 1–27.

Fenizia, A. (2022). Managers and productivity in the public sector. *Econometrica 90*(3), 1063–1084.

Finan, F., B. A. Olken, and R. Pande (2017). The personnel economics of the developing state. In A. V. Banerjee and E. Duflo (Eds.), *Handbook of Economic Field Experiments*, Volume 2 of *Handbook of Economic Field Experiments*, pp. 467 – 514. North-Holland.

Fryer, R. (2014). Injecting charter school best practices into traditional public schools: Evidence from field experiments. *The Quarterly Journal of Economics 129*(3), 1355–1407.

Fryer, R. (2017, May). Management and student achievement: Evidence from a randomized field experiment. Working Paper Series 23437, NBER.

Giorcelli, M. (2019, January). The long-term effects of management and technology transfers. *American Economic Review 109*(1), 121–52.

Hanushek, E. A., S. Link, and L. Wössmann (2013). Does school autonomy make sense everywhere? Panel estimates from PISA. *Journal of Development Economics 104*(C), 212–232.

Hanushek, E. A. and L. Wössmann (2006, March). Does educational tracking affect performance and inequality? Differences- in-differences evidence across countries. *The Economic Journal 116*(510), 63–76.

INEP (2021). Microdados Prova Brasil (SAEB). https://dados.gov.br/dataset/inep-microdados-do-saeb. Accessed: 2021-10-22.

Jerrim, J., L. A. Lopez-Agudo, O. D. Marcenaro-Gutierrez, and N. Shure (2017). What happens when econometrics and psychometrics collide? An example using the PISA data. *Economics of Education Review 61*(C), 51–58.

Lavy, V. (2015). Do differences in schools' instruction time explain international achievement gaps? Evidence from developed and developing countries. *The Economic Journal 125*(588), F397–F424.

Lazear, E. P. (2003). Teacher incentives. *Swedish Economic Policy Review 10*(3), 179–214.

Leaver, C., O. Ozier, P. Serneels, and A. Zeitlin (2021, July). Recruitment, effort and retention effects of performance contracts for civil servants: Experimental evidence from rwandan primary schools. *American Economic Review 111*(7), 2213–46.

Lemos, R., K. Muralidharan, and D. Scur (2021, January). Personnel management and school productivity: Evidence from india. Working Paper 28336, National Bureau of Economic Research.

Liberto, A. D., F. Schivardi, and G. Sulis (2015). Managerial practices and student performance. *Economic Policy 30*(84), 683–728.

McConnell, K. J., K. A. Hoffman, A. Quanbeck, and D. McCarty (2009). Management practices in substance abuse treatment programs. *Journal of Substance Abuse Treatment 37*(1), 79–89.

McCormack, J., C. Propper, and S. Smith (2014). Herding cats? Management and university performance. *The Economic Journal 124*(578), F534–F564.

Moreira, D., M. Akhtari, and L. Trucco (2021). Data and Code for: Political Turnover, Bureaucratic Turnover and the Quality of Public Services. https://doi.org/10.3886/E150323V1. Accessed: 2021-10-22.

OECD (2021). PISA Database. https://www.oecd.org/pisa/data/. Accessed: 2021-10-22.

Rasul, I. and D. Rogger (2016). Management of bureaucrats and public service delivery: Evidence from the Nigerian civil service. *The Economic Journal 128*(608), 413–446.

Romero, M., J. Sandefur, and W. A. Sandholtz (2020, February). Outsourcing education: Experimental evidence from liberia. *American Economic Review 110*(2), 364–400.

Rothstein, J. (2015). Teacher quality policy when supply matters. *American Economic Review 105*(1), 100–130.

Ruhose, J. and G. Schwerdt (2016). Does early educational tracking increase migrant-native achievement gaps? Differences-in-differences evidence across countries. *Economics of Education Review 52*(C), 134–154.

Scur, D., R. Sadun, J. Van Reenen, R. Lemos, and N. Bloom (2021, 06). The World Management Survey at 18: lessons and the way forward. *Oxford Review of Economic Policy 37*(2), 231–258.

Syverson, C. (2011). What determines productivity? *Journal of Economic Literature 49*(2), 326–365.

West, M. R. and L. Wössmann (2010). Every catholic child in a catholic school: Historical resistance to state schooling, contemporary private competition and student achievement across countries. *The Economic Journal 120*(546), F229–F255.

WMS (2021). Data: World Management Survey. https://worldmanagementsurvey.org. Accessed: 2021-10-22.

World Bank (2018). *World Development Report 2018: Learning to Realize Educations Promise*. Washington, DC: World Bank.

Wössmann, L. (2005). The effect heterogeneity of central examinations: Evidence from TIMSS, TIMSSRepeat and PISA. *Education Economics 13*(2), 143–169.

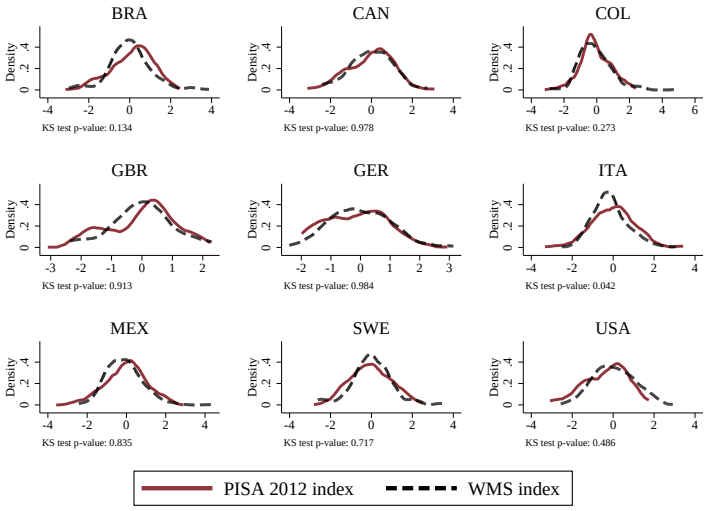
Wössmann, L. (2016, September). The importance of school systems: Evidence from international differences in student achievement. *Journal of Economic Perspectives 30*(3), 3–32.

Wössmann, L., E. Lüdemann, G. Schütz, and M. R. West (2007). School accountability, autonomy, choice, and the level of student achievement. *OECD Publishing, Paris* (13).

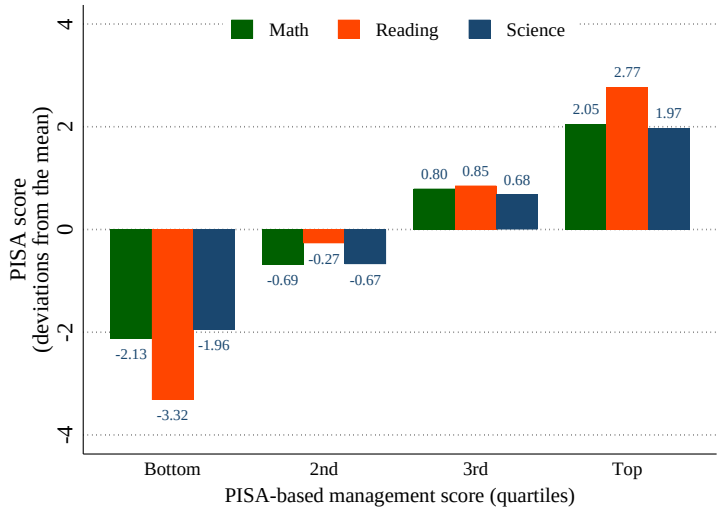
Figures and Tables

Figure 1: Index validation, PISA

(a) Distribution of overall management scores



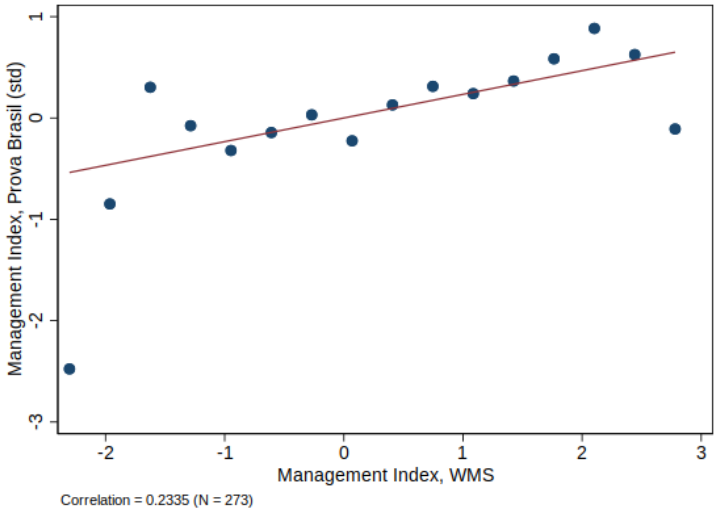
(b) Management and student learning outcomes



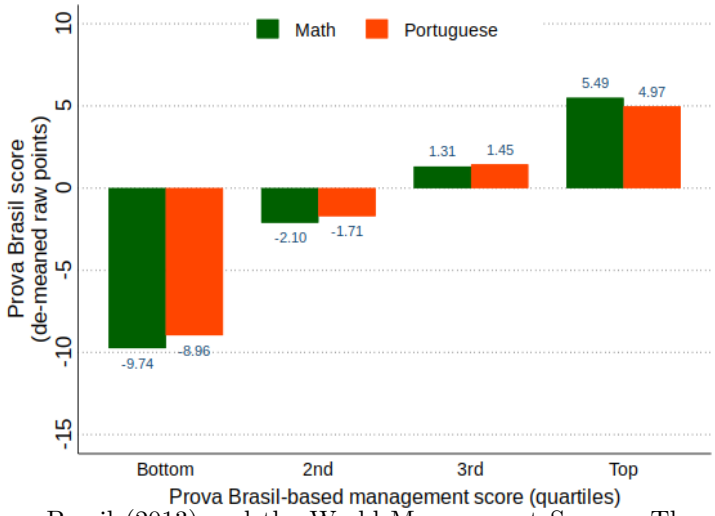
Note: Data for the World Management Survey and PISA 2012. Management indices standardized within country. Kernel density curves estimated using WMS sampling weights (calculated as the inverse probability of being interview on log of number of students, public status, and population density by state, province, or NUTS 2 region as a measure of location) for the WMS data and school final weights for the PISA data. Samples include both public and private secondary schools for both datasets, with the exception of Colombia where WMS data is only available for public primary schools. For Panel (a), number of observations are as follows (WMS/PISA): Brazil = 510/561, Canada = 129/770, Colombia = 467/268, Great Britain = 89/422, Germany = 102/158, Italy = 284/926, Mexico = 157/1,327, Sweden = 85/179, United States = 263/136. Panel (b) includes only PISA 2012 data, 15,196 schools across 65 countries. Student outcomes are estimated using five plausible values and collapsed at the school level using PISA's senate weights. Quartiles of the management index are built at the country level. Test scores are presented as deviations from the subject-specific global mean.

Figure 2: Index validation, Prova Brasil

(a) School-specific score correlation, std



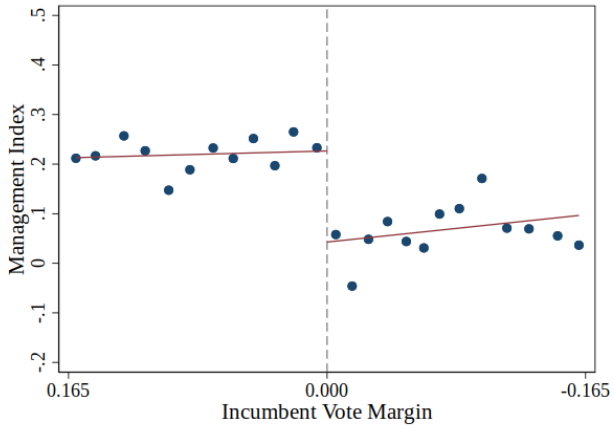
(b) Management and test scores, raw scores



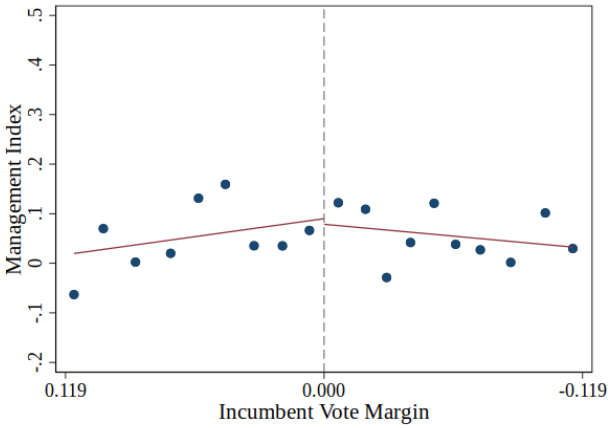
Note: Data from Prova Brasil (2013) and the World Management Survey. The sample contains schools which have data for both Prova Brasil and WMS in 2013, matched at the school level via school identifiers (thus, this sample includes only public schools). Both indices are standardized within-subsample. Panel(a) is a binned scatter plot using 40 quantiles. Panel(b) uses only Prova Brasil data for 2013 (33,344 schools). Sample restricted to schools with grade 9 to maintain closer comparability to the WMS sample. Quartiles of the management index are built from this sample. Test scores are presented as deviations from the subject-specific mean, also within this sample.

Figure 3: Political turnover and school management scores

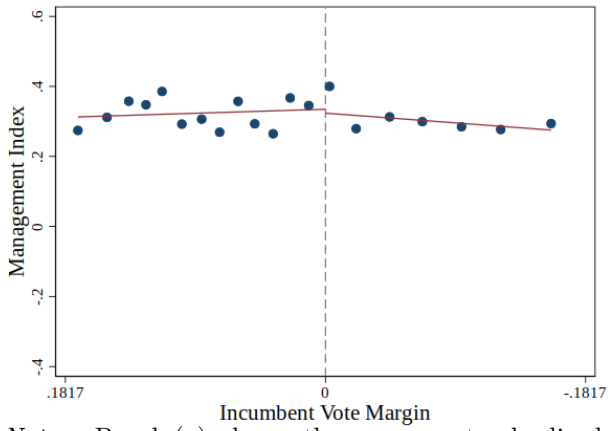
(a) Municipal schools: all



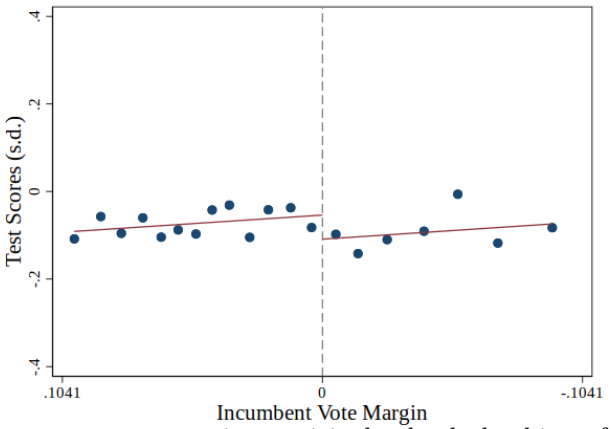
(b) Non-municipal schools (placebo): all



(c) Municipal schools: no post-election school principal replacement

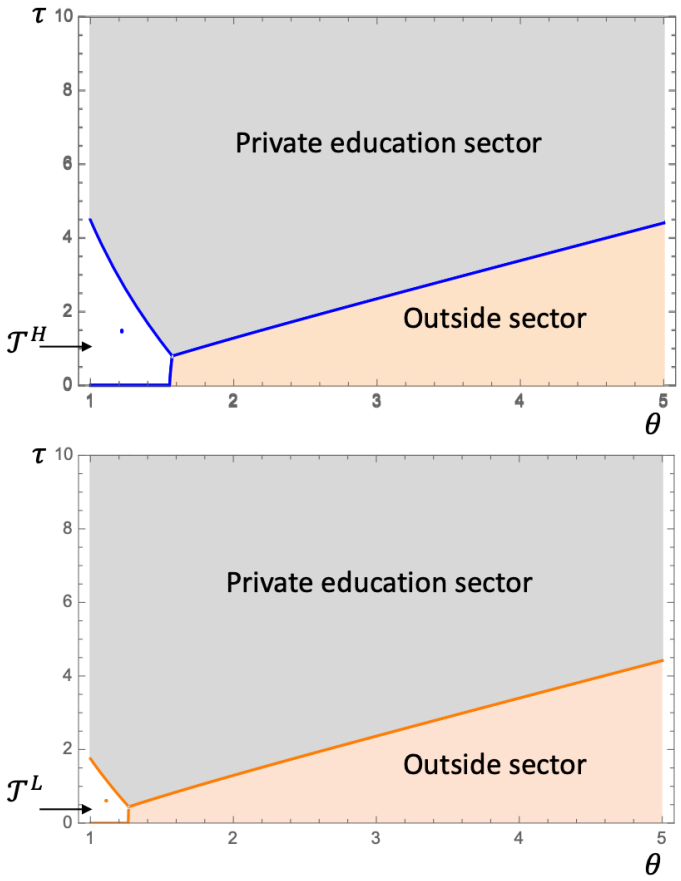


(d) Municipal schools: no post-election school principal replacement



Note: Panel (a) shows the average standardized management score in municipal schools by bins of $IncumbVoteMargin$, controlling for the standardized management score in the baseline year (year before the election). Municipalities with $IncumbVoteMargin < 0$ experienced a change in the political party of the mayor. Municipalities with $IncumbVoteMargin > 0$ did not experience a change in the political party of the mayor. Note that values to the right side of the zero are negative (political turnover), while values on the left side are positive (no political turnover). Selected bandwidth follows Calonico et al. (2017). Panel (b) repeats the analysis for non-municipal schools (a placebo test). Panel (c) repeats the analysis for municipal schools where the school principal was not replaced after the election (the principal reports being in post in his/her current school for at least two years on the Prova Brasil school principal questionnaire). Panel (d) shows the average of individual-level test scores by bins of $IncumbVoteMargin$ in municipal schools, pooling students from grade 5 and grade 9 and controlling for the average, school-level test scores for the respective grade at baseline, restricting the sample to municipal schools where the school principal was not replaced after the election.

Figure 4: Teacher selection



Note: Teacher ability is distributed $\theta \sim U[1,5]$ and teacher intrinsic motivation is distributed $\tau \sim U[0,10]$. In the low management public school $G^L = 30$, $\Delta^L = 0$, and $\gamma^L = 1$. In the high management public school, $G^H = 35$, $\Delta^H = 0.5$ and $\gamma^H = 2$. Other parameters are set at $W = 15$, $B = 40$, $\bar{y} = 4.5$, $\beta = 50$, and $\bar{z} = 1$. The blue point in the top panel shows average teacher ability and average baseline intrinsic motivation among teacher types who select into a high management public school. The (x, y)-coordinates are $(1.21, 1.47)$. The orange point in the bottom panel shows average teacher ability and average baseline intrinsic motivation among teacher types who select into a low management public school. The (x, y)-coordinates are $(1.11, 0.60)$.

Table 1: Management and student performance, PISA

	Reading PISA Points			Math PISA Points			Science PISA Points		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All Schools									
Management Index	3.785	2.441	2.281	3.166	2.081	1.837	2.937	1.957	1.766
	(1.040)	(0.992)	(0.830)	(1.021)	(1.011)	(0.822)	(1.006)	(1.012)	(0.817)
	[0.000]	[0.014]	[0.006]	[0.002]	[0.040]	[0.025]	[0.003]	[0.053]	[0.031]
Private=1		11.180	2.766		11.078	1.809		9.871	1.092
		(2.868)	(2.549)		(2.844)	(2.641)		(2.738)	(2.371)
		[0.000]	[0.278]		[0.000]	[0.493]		[0.000]	[0.645]
Students	410701	410200	410200	410701	410200	410200	410701	410200	410200
Schools	15196	15176	15176	15196	15176	15176	15196	15176	15176
R-Squared	0.243	0.289	0.423	0.306	0.341	0.449	0.299	0.329	0.431
Brazil									
Management Index	7.483	3.493	1.460	8.921	4.980	2.826	10.123	6.230	4.319
	(2.984)	(2.508)	(1.910)	(2.555)	(2.314)	(1.795)	(2.557)	(2.266)	(1.853)
	[0.012]	[0.164]	[0.445]	[0.000]	[0.031]	[0.115]	[0.000]	[0.006]	[0.020]
Private=1		40.236	31.638		39.691	28.895		35.983	26.429
		(16.713)	(13.821)		(15.617)	(13.303)		(12.086)	(9.726)
		[0.016]	[0.022]		[0.011]	[0.030]		[0.003]	[0.007]
Students	14949	14949	14949	14949	14949	14949	14949	14949	14949
Schools	561	561	561	561	561	561	561	561	561
R-Squared	0.009	0.173	0.352	0.014	0.219	0.391	0.018	0.200	0.342
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
School Controls		Y	Y		Y	Y		Y	Y
Student Controls			Y			Y			Y

Note: Standard errors in parentheses, p-values in square brackets. OLS regressions were run with the student-level PISA dataset using the OECDs `repest` Stata command. Standard errors are clustered at the school level and use all 5 plausible values for each subject and student final weights. Main independent variable is the PISA-based management index standardized using the overall distribution. All specifications include country fixed effects (except for panel B, which is restricted to Brazil). School controls: school location (set of dummies for village, small town, town, city, and large city), student-teacher ratio, log of the number of students, ratio of computers connected to the web as a proxy for school resources, and share of government funding relative to total school funding. Student controls: gender, grade compared to modal grade of students taking the PISA exam in the country, an index of economic, social, and cultural status, and immigration status (set of dummies for native, first generation, and second generation). For control variables, missing variables are replaced with a value of -99 and we include an indicator variable with a value of 1 for each imputed value.

Table 2: Management and student performance, Prova Brasil

	Portuguese Score					Mathematics Score				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Management Index	0.121	0.050	0.036	0.032	0.017	0.134	0.052	0.040	0.036	0.019
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Students	23829018	23829018	23829018	23829018	23829018	23827854	23827854	23827854	23827854	23827854
Schools	72683	72683	72683	72683	72683	72683	72683	72683	72683	72683
R-Squared	0.063	0.107	0.133	0.158	0.221	0.042	0.101	0.124	0.149	0.229
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE		Y	Y	Y			Y	Y	Y	
PISA-Like Controls			Y	Y	Y			Y	Y	Y
PB Controls				Y	Y				Y	Y
School FE					Y					Y

Note: Standard errors in parentheses, p-values in square brackets. OLS regressions for PB were run with the student-level PB dataset, pooling grades 5 and 9, for years 2007 to 2017. Standard errors clustered at the school level. Test scores are normalized within grade. All specifications include year fixed effects. PISA-like controls are taken from PB data set and attempt to match school controls and student controls in PISA regressions (Table 1): indicator variable for urban schools, student-teacher ratio, log of the number of students, dummies indicating the presence of a computer lab and whether the school has internet access, gender, student households' consumption index, and a set of dummies for race. Given the availability of principal characteristics, PB controls include principals' age, set of dummies for principals' race, principals' educational attainment (set of dummies for less than high school, high school, undergraduate (pedagogy), undergraduate (math), undergraduate (Portuguese), undergraduate (others), masters, doctoral), indicator for whether the principal holds another job. PB controls also include the class-year-level share of white teachers, share of teachers holding a college degree, and average teacher tenure. For the students, PB controls include dummies for mother educational attainment (grades 1-5, grades 6-9, secondary grades 10-12, and college). For control variables, missing variables are replaced with a value of -99 and we include an indicator variable with a value of 1 for each imputed value.

Table 3: Political turnover and school management scores

	Outcome: Management Index					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Municipal Schools						
$1\{IncumbVoteMargin < 0\}$	-0.198	-0.188	-0.229	-0.222	-0.262	-0.249
	(0.038)	(0.036)	(0.056)	(0.054)	(0.044)	(0.043)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Baseline Management Index	0.350	0.315	0.337	0.298	0.333	0.297
	(0.011)	(0.010)	(0.014)	(0.014)	(0.012)	(0.012)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	12637	12637	6117	6117	9080	9080
R-Squared	0.155	0.172	0.149	0.170	0.144	0.162
Clusters	2689	2689	1563	1563	2130	2130
Using Bandwidth	0.165	0.165	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.165	0.165	0.165	0.165	0.165	0.165
Panel B. Non-Municipal Schools						
$1\{IncumbVoteMargin < 0\}$	-0.012	-0.004	0.032	0.058	-0.001	0.010
	(0.054)	(0.052)	(0.069)	(0.064)	(0.056)	(0.053)
	[0.825]	[0.932]	[0.647]	[0.363]	[0.983]	[0.854]
Baseline Management Index	0.395	0.365	0.384	0.349	0.391	0.359
	(0.015)	(0.015)	(0.018)	(0.017)	(0.015)	(0.014)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	6115	6115	3965	3965	5663	5663
R-Squared	0.173	0.191	0.166	0.189	0.172	0.193
Clusters	1977	1977	1390	1390	1875	1875
Using Bandwidth	0.119	0.119	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.119	0.119	0.119	0.119	0.119	0.119
Panel C. Munic. Schools, No Prin. Replac.						
$1\{IncumbVoteMargin < 0\}$	-0.068	-0.070	-0.100	-0.110	-0.064	-0.077
	(0.047)	(0.047)	(0.074)	(0.074)	(0.061)	(0.062)
	[0.147]	[0.131]	[0.178]	[0.137]	[0.297]	[0.211]
Baseline Management Index	0.391	0.371	0.366	0.343	0.370	0.348
	(0.014)	(0.014)	(0.020)	(0.021)	(0.018)	(0.018)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	5122	5122	2222	2222	3329	3329
R-Squared	0.212	0.220	0.195	0.208	0.197	0.208
Clusters	1607	1607	804	804	1143	1143
Using Bandwidth	0.182	0.182	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.182	0.182	0.182	0.182	0.182	0.182
Controls		Y		Y		Y

Note: Panel A: Standard errors in parentheses, p-values in square brackets. This table reports the coefficient on political party turnover from regressing standardized management scores in municipal schools on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($IncumbVoteMargin < 0$), and the interaction of these two variables for the set of municipalities with $IncumbVoteMargin < UsingBandwidth$. We also control for baseline standardized management scores in the year before the election. Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the schools trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator. Optimal bandwidth follows Calonico et al. (2017). Panel B: repeat of the analysis in Panel A using non-municipal schools (state and federal schools). Only public schools participate in the Prova Brasil exam. Panel C: repeat of the analysis in Panel A for the municipal schools where the school principal was not replaced. New school principals are those that report being the head of their current school for less than two years on the Prova Brasil school principal questionnaire.

Table 4: Management and school functioning

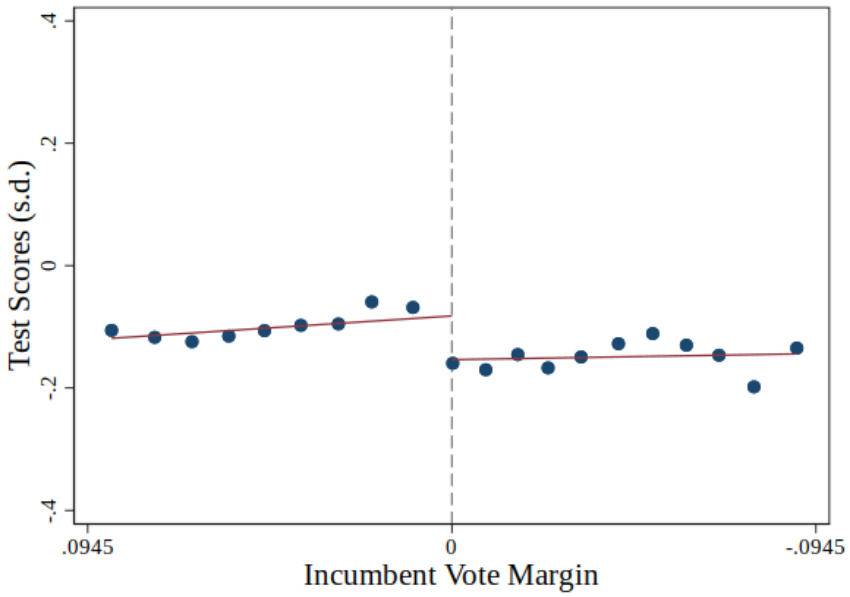
	Teachers						Households	
	(1) shortage	(2) shortage	(3) motivation	(4) motivation	(5) effort	(6) effort	(7) effort	(8) effort
Panel A. PISA								
Management Index	-0.060	-0.060	0.306	0.325	0.049	0.075	0.255	0.283
	(0.023)	(0.023)	(0.027)	(0.025)	(0.024)	(0.023)	(0.029)	(0.027)
	[0.009]	[0.009]	[0.000]	[0.000]	[0.043]	[0.001]	[0.000]	[0.000]
Observations	12133	12133	12133	12133	12133	12133	12133	12133
Schools	12133	12133	12133	12133	12133	12133	12133	12133
R-Squared	0.030	0.049	0.093	0.125	0.011	0.063	0.077	0.155
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
School Controls		Y		Y		Y		Y
Student Controls		Y		Y		Y		Y
Panel B. Prova Brasil								
Management Index	-0.033	-0.088	0.229	0.218	0.017	0.059	0.044	0.054
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	322127	322127	315885	315885	322273	322273	322313	322313
Schools	72658	72658	72321	72321	72686	72686	72688	72688
R-Squared	0.001	0.448	0.052	0.377	0.000	0.490	0.002	0.481
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
PISA-Like Controls		Y		Y		Y		Y
PB Controls		Y		Y		Y		Y
School FE		Y		Y		Y		Y

Note: Standard errors in parentheses, p-values in square brackets. Panel A: All regressions use data from public schools only. The table reports coefficients from school-level regressions of the PISA-based management index standardized using the overall distribution on each of the intermediate school outcomes (also standardized). All specifications include PISA school final weights and country fixed effects. School controls: school location (set of dummies for village, small town, town, city, and large city), student-teacher ratio, log of the number of students, ratio of computers connected to the web as a proxy for school resources, and share of government funding relative to total school funding. Student controls: gender, grade compared to modal grade of students taking the PISA exam in the country, an index of economic, social, and cultural status, and immigration status (set of dummies for native, first generation, and second generation). Panel B: PB exam is applied in public schools only. The table reports coefficients from school-level regressions of the PB-based management index standardized using the overall distribution on each of the intermediate school outcomes (also standardized). All specifications include year fixed effects. PISA-like controls are taken from PB data set and attempt to match school controls and student controls in PISA regressions (Table 1): indicator variable for urban schools, student-teacher ratio, log of the number of students, dummies indicating the presence of a computer lab and whether the school has internet access, gender, student households' consumption index, and a set of dummies for race. Given the availability of principal characteristics, PB controls include principals' age, set of dummies for principals' race, principals' educational attainment (set of dummies for less than high school, high school, undergraduate (pedagogy), undergraduate (math), undergraduate (Portuguese), undergraduate (others), masters, doctoral), indicator for whether the principal holds another job. PB controls also include the class-year-level share of white teachers, share of teachers holding a college degree, and average teacher tenure. For the students, PB controls include dummies for mother educational attainment (grades 1-5, grades 6-9, secondary grades 10-12, and college). In both panels: For control variables, missing variables are replaced with a value of -99 and we include an indicator variable with a value of 1 for each imputed value.

ONLINE APPENDIX—NOT FOR PUBLICATION, September 1, 2022
"Understanding school management with public data: A new measurement approach and applications, Leaver, Lemos and Scur"

A Additional Figures and Tables

Figure A.1: Political turnover and test scores: municipal schools



Note: This figure is replicated from Akhtari et al. (2022) using the AER replication files. It shows the average of individual-level test scores by bins of $IncumbVoteMargin$ in municipal schools, pooling students from grade 5 and grade 9 and controlling for the average, school-level test scores for the respective grade at baseline. Municipalities with $IncumbVoteMargin < 0$ experienced a change in the political party of the mayor. Municipalities with $IncumbVoteMargin > 0$ did not experience a change in the political party of the mayor. Note that values to the right side of the zero are negative (political turnover), while values on the left side are positive (no political turnover). Selected bandwidth follows Calonico et al. (2017).

Table A.1: Political turnover and test scores

	Outcome: Test Scores					
	(1)	(2)	(3)	(4)	(5)	(6)
Municipal Schools						
$1\{IncumbVoteMargin < 0\}$	-0.067	-0.053	-0.077	-0.067	-0.064	-0.052
	(0.022)	(0.021)	(0.024)	(0.023)	(0.020)	(0.019)
	[0.002]	[0.012]	[0.001]	[0.004]	[0.002]	[0.007]
School-Level Baseline Test Scores	0.846	0.741	0.843	0.740	0.839	0.735
	(0.011)	(0.011)	(0.013)	(0.012)	(0.010)	(0.010)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	550460	550460	422025	422025	621148	621148
R-Squared	0.201	0.228	0.198	0.225	0.200	0.227
Clusters	1952	1952	1585	1585	2163	2163
Using Bandwidth	0.095	0.095	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.095	0.095	0.095	0.095	0.095	0.095
Munic. Schools, No Prin. Replac.						
$1\{IncumbVoteMargin < 0\}$	-0.044	-0.045	-0.049	-0.052	-0.040	-0.041
	(0.030)	(0.029)	(0.036)	(0.035)	(0.029)	(0.029)
	[0.149]	[0.123]	[0.180]	[0.136]	[0.171]	[0.154]
School-Level Baseline Test Scores	0.847	0.750	0.844	0.753	0.843	0.747
	(0.015)	(0.015)	(0.017)	(0.018)	(0.014)	(0.015)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	213008	213008	151434	151434	222225	222225
R-Squared	0.210	0.234	0.204	0.227	0.208	0.231
Clusters	1111	1111	810	810	1153	1153
Using Bandwidth	0.104	0.104	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.104	0.104	0.104	0.104	0.104	0.104
Controls		Y		Y		Y

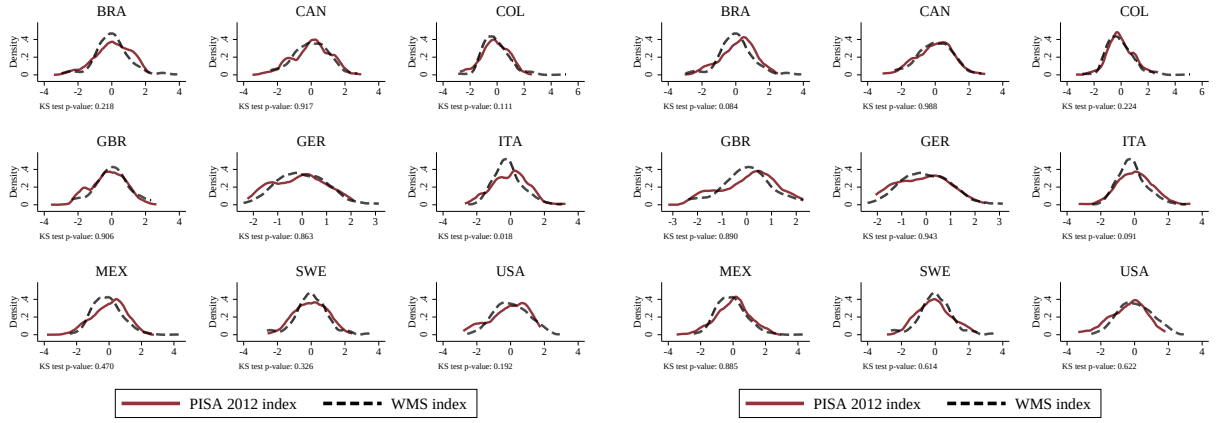
Note: This table is replicated from Akhtari et al. (2022) using the AER replication files. Standard errors in parentheses, p-values in square brackets. The top panel reports the coefficient from regressions of individual-level test scores on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($IncumbVoteMargin < 0$), and the interaction of these two variables for the set of municipalities with $IncumbVoteMargin < UsingBandwidth$, pooling students from grade 5 and grade 9. We also control for the average, school-level test scores for the respective grade at baseline. Test scores are from the Prova Brasil exam and are standardized based on the distribution of individual-level test scores in municipalities with no change in the ruling party. Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the schools trash is regularly collected, and the school has Internet), individual-level controls (an indicator variable for gender, whether the student is white, and whether the student sees their mother reading), and a 2012 election-cycle indicator. Optimal bandwidth follows Calonico et al. (2017). The bottom panel repeats the analysis in the top panel for the municipal schools where the school principal was not replaced. New principals are those that report being the head of their current school for less than two years on the Prova Brasil school principal questionnaire.

B Alternative Index Building

Figure B.1: Index validation: PISA

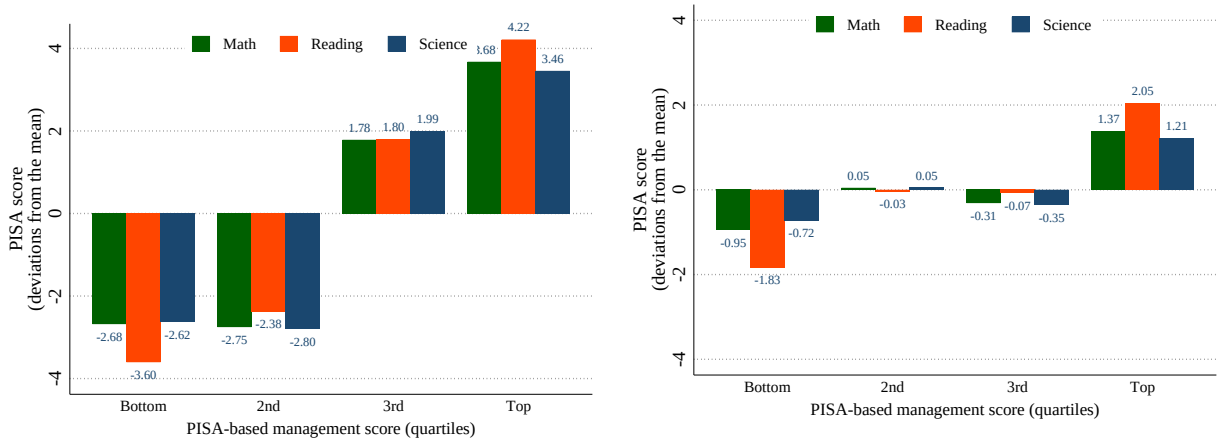
(a) Distribution: Anderson (2008) Index

(b) Distribution: Principal Component Analysis



(c) Test Scores: Anderson (2008) Index

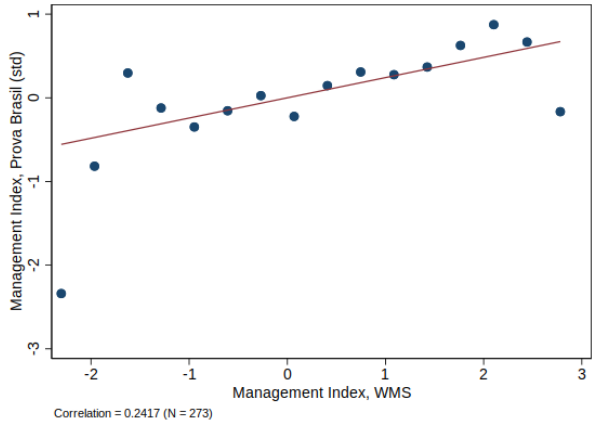
(d) Test Scores: Principal Component Analysis



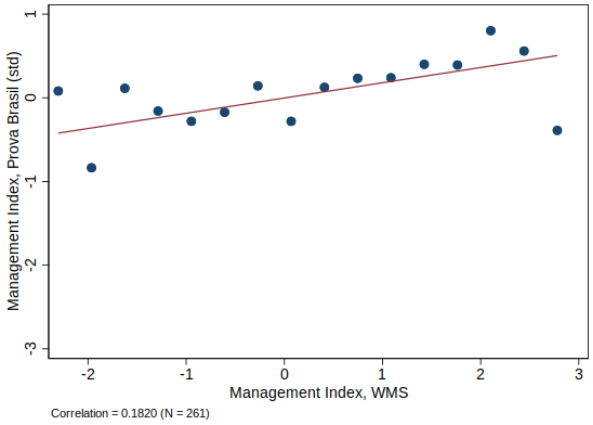
Note: Data for the World Management Survey and PISA 2012. Management indices standardized within country. Kernel density curves estimated using WMS sampling weights (calculated as the inverse probability of being interview on log of number of students, public status, and population density by state, province, or NUTS 2 region as a measure of location) for the WMS data and school final weights for the PISA data. Samples include both public and private secondary schools for both datasets, with the exception of Colombia where WMS data is only available for public primary schools. For Panels (a) and (b), number of observations are as follows (WMS/PISA): Brazil = 510/561, Canada = 129/770, Colombia = 467/268, Great Britain = 89/422, Germany = 102/158, Italy = 284/926, Mexico = 157/1,327, Sweden = 85/179, United States = 263/136. Panels (c) and (d) include only PISA 2012 data, 15,196 schools across 65 countries. Student outcomes are estimated using five plausible values and collapsed at the school level using PISA's senate weights. Quartiles of the management index are built at the country level. Test scores are presented as deviations from the subject-specific global mean.

Figure B.2: Index validation: Prova Brasil

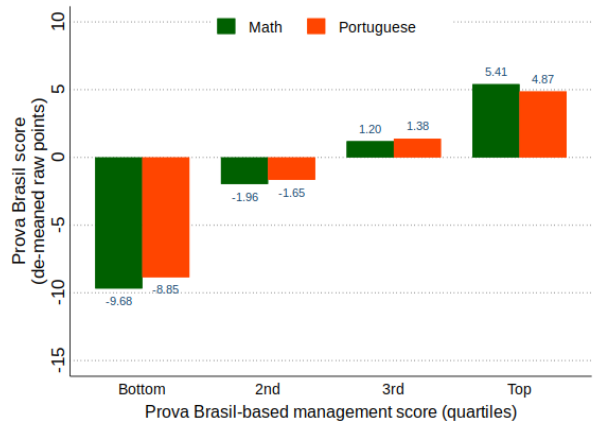
(a) Management Scores: Anderson (2008) Index



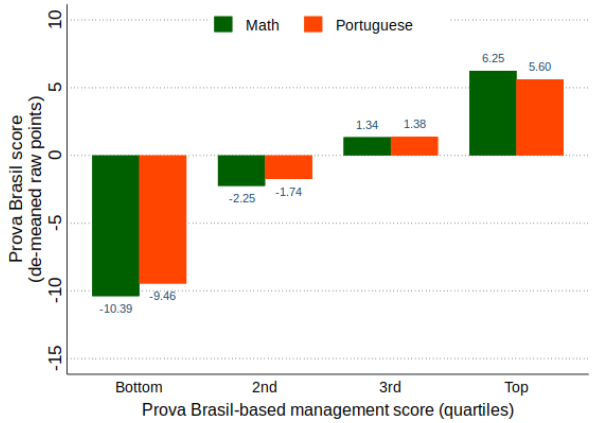
(b) Management Scores: PCA



(c) Test Scores: Anderson



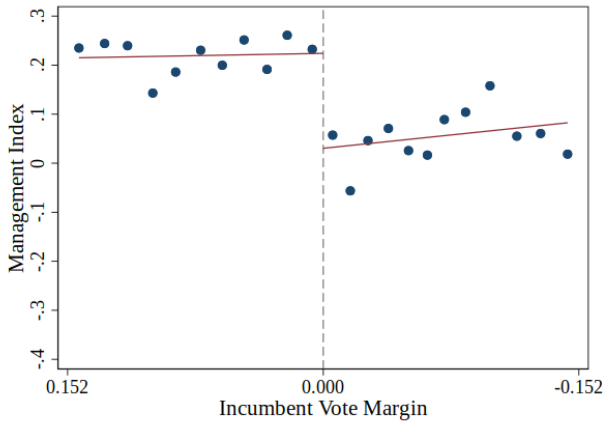
(d) Test Scores: PCA



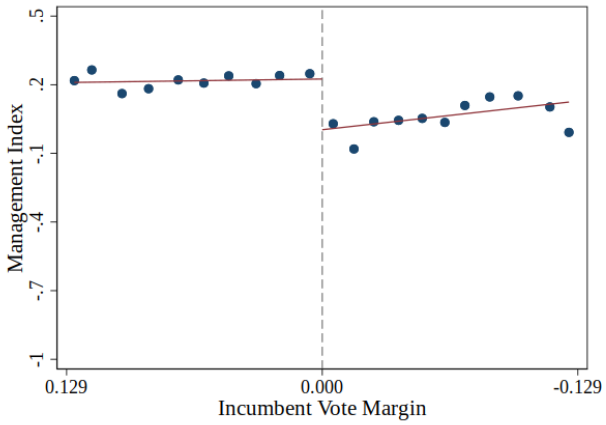
Note: Data from Prova Brasil (2013) and the World Management Survey. The sample contains schools which have data for both Prova Brasil and WMS in 2013, matched at the school level via school identifiers (thus, this sample includes only public schools). Both indices are standardized within-subsample. Panels (a) and (b) are binned scatterplots using 40 quantiles. Panels (b) and (c) use only Prova Brasil data for 2013 (33,344 schools). Sample restricted to schools with grade 9 to maintain closer comparability to the WMS sample. Quartiles of the management index are built from this sample. Test scores are presented as deviations from the subject-specific mean, also within this sample.

Figure B.3: Political turnover and management scores

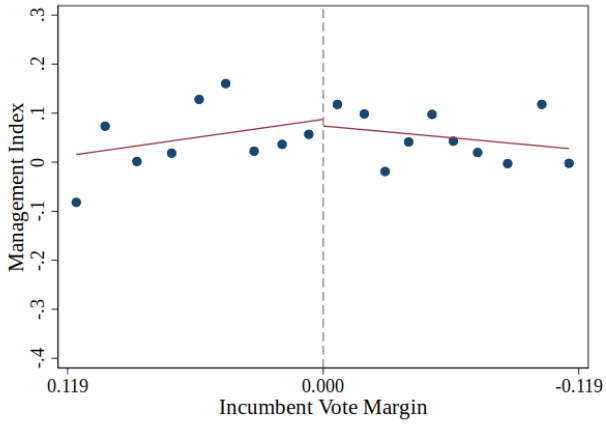
(a) Municipal schools (treated): Anderson



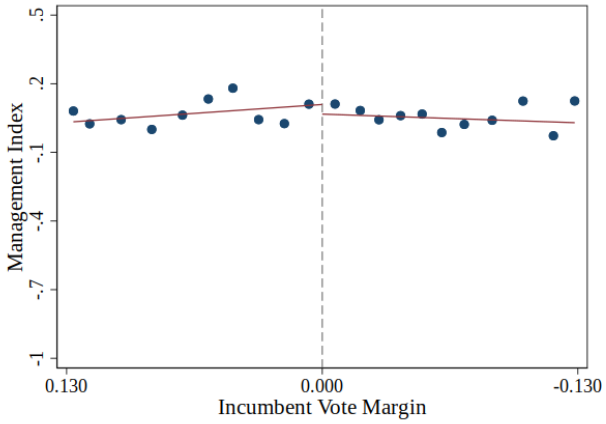
(b) Municipal schools (treated): PCA



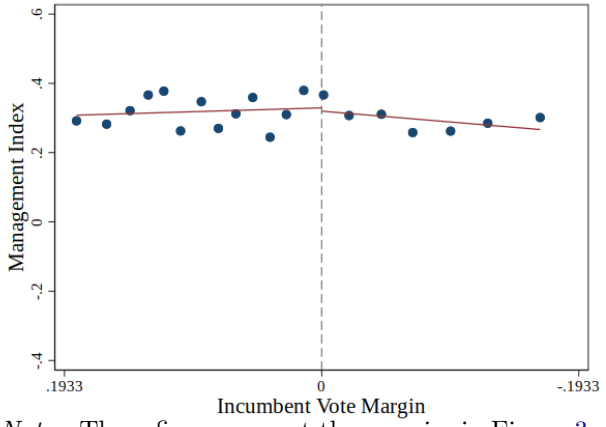
(c) Placebo schools (non-municipal): Anderson



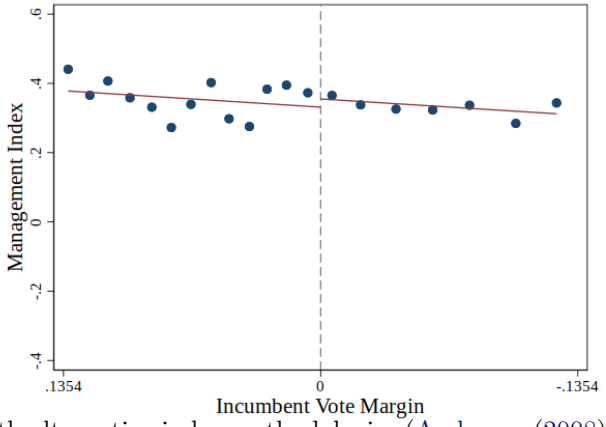
(d) Placebo schools (non-municipal): PCA



(e) Munic., no principal replac.: Anderson



(f) Munic., no principal replac.: PCA



Note: These figures repeat the exercise in Figure 3 with alternative index methodologies (Anderson (2008) and Principal Component Analysis).

Table B.1: Management and student performance, PISA: Anderson (2008) Index

	Reading PISA Points			Math PISA Points			Science PISA Points		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All Schools									
Management Index	4.238	2.984	2.280	3.965	2.943	2.140	3.595	2.677	1.930
	(1.088)	(1.014)	(0.912)	(1.146)	(1.098)	(0.936)	(1.112)	(1.082)	(0.916)
	[0.000]	[0.003]	[0.012]	[0.001]	[0.007]	[0.022]	[0.001]	[0.013]	[0.035]
Private=1		11.268	2.767		11.223	1.865		9.991	1.122
		(2.913)	(2.587)		(2.896)	(2.670)		(2.781)	(2.399)
		[0.000]	[0.285]		[0.000]	[0.485]		[0.000]	[0.640]
Students	410701	410200	410200	410701	410200	410200	410701	410200	410200
Schools	15196	15176	15176	15196	15176	15176	15196	15176	15176
R-Squared	0.243	0.290	0.423	0.307	0.342	0.450	0.299	0.330	0.431
Brazil									
Management Index	9.119	3.672	2.233	10.572	5.339	3.793	10.501	5.445	4.045
	(3.148)	(2.237)	(1.789)	(2.849)	(1.928)	(1.546)	(2.784)	(2.030)	(1.678)
	[0.004]	[0.101]	[0.212]	[0.000]	[0.006]	[0.014]	[0.000]	[0.007]	[0.016]
Private=1		41.318	31.984		41.214	29.646		38.117	27.849
		(17.121)	(14.349)		(16.059)	(13.932)		(12.224)	(10.066)
		[0.016]	[0.026]		[0.010]	[0.033]		[0.002]	[0.006]
Students	14949	14949	14949	14949	14949	14949	14949	14949	14949
Schools	561	561	561	561	561	561	561	561	561
R-Squared	0.014	0.173	0.353	0.022	0.220	0.392	0.022	0.199	0.341
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
School Controls		Y	Y		Y	Y		Y	Y
Student Controls			Y			Y			Y

Note: Standard errors in parentheses, p-values in square brackets. OLS regressions were run with the student-level PISA dataset using the OECDs `repest` Stata command. Standard errors are clustered at the school level and use all 5 plausible values for each subject and student final weights. Main independent variable is the PISA-based management index standardized using the overall distribution, built using Anderson (2008) index method. All specifications include country fixed effects (except for panel B, which is restricted to Brazil). School controls: school location (set of dummies for village, small town, town, city, and large city), student-teacher ratio, log of the number of students, ratio of computers connected to the web as a proxy for school resources, and share of government funding relative to total school funding. Student controls: gender, grade compared to modal grade of students taking the PISA exam in the country, an index of economic, social, and cultural status, and immigration status (set of dummies for native, first generation, and second generation). For control variables, missing variables are replaced with a value of -99 and we include an indicator variable with a value of 1 for each imputed value.

Table B.2: Management and student performance, PISA: Principal Component Analysis Index

	Reading PISA Points			Math PISA Points			Science PISA Points		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
All Schools									
Management Index	3.104	1.891	1.947	2.433	1.458	1.465	2.213	1.334	1.379
	(1.045)	(0.972)	(0.791)	(0.988)	(0.952)	(0.766)	(0.967)	(0.957)	(0.765)
	[0.003]	[0.052]	[0.014]	[0.014]	[0.126]	[0.056]	[0.022]	[0.163]	[0.071]
Private=1		11.128	2.252		10.819	1.258		9.921	0.848
		(2.933)	(2.542)		(2.888)	(2.643)		(2.809)	(2.404)
		[0.000]	[0.376]		[0.000]	[0.634]		[0.000]	[0.724]
Students	409029	408528	408528	409029	408528	408528	409029	408528	408528
Schools	15139	15119	15119	15139	15119	15119	15139	15119	15119
R-Squared	0.241	0.288	0.422	0.305	0.340	0.449	0.297	0.327	0.429
Brazil									
Management Index	6.172	2.906	0.909	7.773	4.578	2.463	9.020	5.815	3.949
	(3.068)	(2.595)	(1.967)	(2.747)	(2.461)	(1.885)	(2.659)	(2.342)	(1.882)
	[0.044]	[0.263]	[0.644]	[0.005]	[0.063]	[0.191]	[0.001]	[0.013]	[0.036]
Private=1		40.284	31.793		39.467	28.804		35.910	26.464
		(16.490)	(13.659)		(15.428)	(13.106)		(12.049)	(9.645)
		[0.015]	[0.020]		[0.011]	[0.028]		[0.003]	[0.006]
Students	14777	14777	14777	14777	14777	14777	14777	14777	14777
Schools	555	555	555	555	555	555	555	555	555
R-Squared	0.006	0.173	0.352	0.010	0.220	0.391	0.014	0.200	0.342
Country FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
School Controls		Y	Y		Y	Y		Y	Y
Student Controls			Y			Y			Y

Note: Standard errors in parentheses, p-values in square brackets. OLS regressions were run with the student-level PISA dataset using the OECDs `repest` Stata command. Standard errors are clustered at the school level and use all 5 plausible values for each subject and student final weights. Main independent variable is the PISA-based management index standardized using the overall distribution, built using Principal Component Analysis. All specifications include country fixed effects (except for panel B, which is restricted to Brazil). School controls: school location (set of dummies for village, small town, town, city, and large city), student-teacher ratio, log of the number of students, ratio of computers connected to the web as a proxy for school resources, and share of government funding relative to total school funding. Student controls: gender, grade compared to modal grade of students taking the PISA exam in the country, an index of economic, social, and cultural status, and immigration status (set of dummies for native, first generation, and second generation). For control variables, missing variables are replaced with a value of -99 and we include an indicator variable with a value of 1 for each imputed value.

Table B.3: Management and student performance, Prova Brasil: Anderson (2008) Index

	Portuguese Score					Mathematics Score				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Management Index	0.118	0.051	0.037	0.033	0.016	0.131	0.054	0.042	0.038	0.019
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Students	23829018	23829018	23829018	23829018	23829018	23827854	23827854	23827854	23827854	23827854
Schools	72683	72683	72683	72683	72683	72683	72683	72683	72683	72683
R-Squared	0.062	0.107	0.133	0.159	0.221	0.041	0.101	0.124	0.149	0.229
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE		Y	Y	Y			Y	Y	Y	
PISA-Like Controls			Y	Y	Y			Y	Y	Y
PB Controls				Y	Y				Y	Y
School FE					Y					Y

Note: Standard errors in parentheses, p-values in square brackets. OLS regressions for Prova Brasil (PB) run with the student-level Prova Brasil dataset, pooling grades 5 and 9, for years 2007 to 2017. Standard errors clustered at the school level. Test scores are normalized within grade. Management index built using Anderson (2008) method. All specifications include year fixed effects. PISA-like controls are taken from PB data set and attempt to match school controls and student controls in PISA regressions: indicator variable for urban schools, student-teacher ratio, log of the number of students, dummies indicating the presence of a computer lab and whether the school has internet access, gender, student households' consumption index, and a set of dummies for race. Given the availability of principal characteristics, PB controls include principals' age, set of dummies for principals' race, principals' educational attainment (set of dummies for less than high school, high school, undergraduate (pedagogy), undergraduate (math), undergraduate (Portuguese), undergraduate (others), masters, doctoral), indicator for whether the principal holds another job. PB controls also include the class-year-level share of white teachers, share of teachers holding a college degree, and average teacher tenure. For the students, PB controls include dummies for mother educational attainment (grades 1-5, grades 6-9, secondary grades 10-12, and college). For control variables, missing variables are replaced with a value of -99 and we include an indicator variable with a value of 1 for each imputed value.

Table B.4: Management and student performance, Prova Brasil: Principal Component Analysis Index

	Portuguese Score					Mathematics Score				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Management Index	0.133	0.061	0.046	0.041	0.022	0.148	0.064	0.051	0.046	0.024
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Students	22496848	22496848	22496848	22496848	22496848	22495956	22495956	22495956	22495956	22495956
Schools	71832	71832	71832	71832	71832	71832	71832	71832	71832	71832
R-Squared	0.068	0.110	0.136	0.161	0.223	0.047	0.104	0.126	0.151	0.230
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
State FE		Y	Y	Y			Y	Y	Y	
PISA-Like Controls			Y	Y	Y			Y	Y	Y
PB Controls				Y	Y				Y	Y
School FE					Y					Y

Note: Standard errors in parentheses, p-values in square brackets. OLS regressions for Prova Brasil (PB) run with the student-level Prova Brasil dataset, pooling grades 5 and 9, for years 2007 to 2017. Standard errors clustered at the school level. Test scores are normalized within grade. Management index built using Principal Component Analysis. All specifications include year fixed effects. PISA-like controls are taken from PB data set and attempt to match school controls and student controls in PISA regressions: indicator variable for urban schools, student-teacher ratio, log of the number of students, dummies indicating the presence of a computer lab and whether the school has internet access, gender, student households' consumption index, and a set of dummies for race. Given the availability of principal characteristics, PB controls include principals' age, set of dummies for principals' race, principals' educational attainment (set of dummies for less than high school, high school, undergraduate (pedagogy), undergraduate (math), undergraduate (Portuguese), undergraduate (others), masters, doctoral), indicator for whether the principal holds another job. PB controls also include the class-year-level share of white teachers, share of teachers holding a college degree, and average teacher tenure. For the students, PB controls include dummies for mother educational attainment (grades 1-5, grades 6-9, secondary grades 10-12, and college). For control variables, missing variables are replaced with a value of -99 and we include an indicator variable with a value of 1 for each imputed value.

Table B.5: Political turnover and school management scores: Anderson

	Outcome: Management Index					
	(1)	(2)	(3)	(4)	(5)	(6)
Municipal Schools						
$1\{IncumbVoteMargin < 0\}$	-0.202	-0.186	-0.232	-0.223	-0.266	-0.249
	(0.040)	(0.038)	(0.058)	(0.055)	(0.046)	(0.044)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Baseline Management Index	0.336	0.301	0.326	0.286	0.323	0.287
	(0.011)	(0.010)	(0.014)	(0.014)	(0.012)	(0.012)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	11957	11957	6117	6117	9080	9080
R-Squared	0.142	0.163	0.137	0.162	0.133	0.154
Clusters	2575	2575	1563	1563	2130	2130
Using Bandwidth	0.152	0.152	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.152	0.152	0.152	0.152	0.152	0.152
Non-Municipal Schools						
$1\{IncumbVoteMargin < 0\}$	-0.005	0.003	0.033	0.059	-0.001	0.010
	(0.054)	(0.052)	(0.069)	(0.064)	(0.055)	(0.053)
	[0.926]	[0.959]	[0.629]	[0.355]	[0.985]	[0.846]
Baseline Management Index	0.381	0.353	0.370	0.338	0.375	0.347
	(0.015)	(0.015)	(0.018)	(0.017)	(0.015)	(0.014)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	6122	6122	3965	3965	5663	5663
R-Squared	0.157	0.174	0.152	0.173	0.156	0.175
Clusters	1978	1978	1390	1390	1875	1875
Using Bandwidth	0.119	0.119	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.119	0.119	0.119	0.119	0.119	0.119
Munic. Schools, No Headm. Replac.						
$1\{IncumbVoteMargin < 0\}$	-0.070	-0.071	-0.102	-0.110	-0.062	-0.074
	(0.046)	(0.046)	(0.076)	(0.076)	(0.063)	(0.063)
	[0.132]	[0.125]	[0.180]	[0.148]	[0.326]	[0.242]
Baseline Management Index	0.386	0.367	0.361	0.339	0.366	0.345
	(0.014)	(0.014)	(0.020)	(0.021)	(0.018)	(0.018)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	5299	5299	2222	2222	3329	3329
R-Squared	0.200	0.210	0.183	0.196	0.186	0.196
Clusters	1657	1657	804	804	1143	1143
Using Bandwidth	0.193	0.193	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.193	0.193	0.193	0.193	0.193	0.193
Controls		Y		Y		Y

Note: Data from Prova Brasil. Management index built using Anderson (2008) method. Panel A: Standard errors in parentheses, p-values in square brackets. This table reports the coefficient on political party turnover from regressing standardized management scores in municipal schools on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($IncumbVoteMargin < 0$), and the interaction of these two variables for the set of municipalities with $IncumbVoteMargin < UsingBandwidth$. We also control for baseline standardized management scores in the year before the election. Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the schools trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator. Optimal bandwidth follows Calonico et al. (2017). Panel B: repeat of the analysis in Panel A using non-municipal schools (state and federal schools). Only public schools participate in the Prova Brasil exam. Panel C: repeat of the analysis in Panel A for the municipal schools where the school principal was not replaced. New school principals are those that report being the head of their current school for less than two years on the Prova Brasil school principal questionnaire.

Table B.6: Political turnover and school management scores: PCA

	Outcome: Management Index					
	(1)	(2)	(3)	(4)	(5)	(6)
Municipal Schools						
$1\{IncumbVoteMargin < 0\}$	-0.238	-0.237	-0.259	-0.256	-0.285	-0.278
	(0.043)	(0.041)	(0.058)	(0.056)	(0.047)	(0.045)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Baseline Management Index	0.373	0.334	0.373	0.333	0.368	0.329
	(0.011)	(0.011)	(0.014)	(0.014)	(0.012)	(0.012)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	9338	9338	5352	5352	7997	7997
R-Squared	0.175	0.193	0.177	0.199	0.170	0.188
Clusters	2194	2194	1424	1424	1961	1961
Using Bandwidth	0.129	0.129	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.129	0.129	0.129	0.129	0.129	0.129
Non-Municipal Schools						
$1\{IncumbVoteMargin < 0\}$	-0.021	-0.023	0.028	0.054	-0.036	-0.028
	(0.052)	(0.050)	(0.071)	(0.068)	(0.057)	(0.055)
	[0.678]	[0.649]	[0.692]	[0.423]	[0.528]	[0.606]
Baseline Management Index	0.432	0.402	0.420	0.386	0.427	0.396
	(0.014)	(0.014)	(0.018)	(0.017)	(0.015)	(0.014)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	5677	5677	3387	3387	4839	4839
R-Squared	0.212	0.229	0.203	0.226	0.207	0.225
Clusters	1940	1940	1267	1267	1717	1717
Using Bandwidth	0.130	0.130	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.130	0.130	0.130	0.130	0.130	0.130
Munic. Schools, No Headm. Replac.						
$1\{IncumbVoteMargin < 0\}$	-0.028	-0.045	-0.061	-0.070	-0.030	-0.048
	(0.054)	(0.054)	(0.078)	(0.078)	(0.063)	(0.064)
	[0.601]	[0.406]	[0.436]	[0.365]	[0.633]	[0.456]
Baseline Management Index	0.412	0.389	0.389	0.363	0.403	0.376
	(0.016)	(0.016)	(0.019)	(0.020)	(0.018)	(0.019)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	3987	3987	2111	2111	3174	3174
R-Squared	0.229	0.241	0.216	0.232	0.219	0.231
Clusters	1309	1309	779	779	1113	1113
Using Bandwidth	0.135	0.135	0.070	0.070	0.110	0.110
Optimal Bandwidth	0.135	0.135	0.135	0.135	0.135	0.135
Controls		Y		Y		Y

Note: Data from Prova Brasil. Management index built using Principal Component Analysis. Panel A: Standard errors in parentheses, p-values in square brackets. This table reports the coefficient on political party turnover from regressing standardized management scores in municipal schools on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($IncumbVoteMargin < 0$), and the interaction of these two variables for the set of municipalities with $IncumbVoteMargin < UsingBandwidth$. We also control for baseline standardized management scores in the year before the election. Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the schools trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator. Optimal bandwidth follows Calonico et al. (2017). Panel B: repeat of the analysis in Panel A using non-municipal schools (state and federal schools). Only public schools participate in the Prova Brasil exam. Panel C: repeat of the analysis in Panel A for the municipal schools where the school principal was not replaced. New school principals are those that report being the head of their current school for less than two years on the Prova Brasil school principal questionnaire.

Table B.7: Management and school functioning: Anderson (2008) Index

	Teachers						Households	
	(1) shortage	(2) shortage	(3) motivation	(4) motivation	(5) effort	(6) effort	(7) effort	(8) effort
PISA								
Management Index	-0.076	-0.072	0.250	0.260	0.048	0.065	0.204	0.216
	(0.023)	(0.022)	(0.025)	(0.024)	(0.026)	(0.024)	(0.027)	(0.025)
	[0.001]	[0.001]	[0.000]	[0.000]	[0.064]	[0.008]	[0.000]	[0.000]
Observations	12133	12133	12133	12133	12133	12133	12133	12133
Schools	12133	12133	12133	12133	12133	12133	12133	12133
R-Squared	0.032	0.052	0.061	0.083	0.011	0.060	0.047	0.090
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
School Controls		Y		Y		Y		Y
Student Controls		Y		Y		Y		Y
Prova Brasil								
Management Index	-0.046	-0.090	0.244	0.236	0.016	0.059	0.044	0.052
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	322127	322127	315885	315885	322273	322273	322313	322313
Schools	72658	72658	72321	72321	72686	72686	72688	72688
R-Squared	0.002	0.448	0.059	0.375	0.000	0.484	0.002	0.443
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
PISA-Like Controls		Y		Y		Y		Y
PB Controls		Y		Y		Y		Y
School FE		Y		Y		Y		Y

Note: Standard errors in parentheses, p-values in square brackets. Management Index built using Anderson (2008) method. Panel A: All regressions use data from public schools only. The table reports coefficients from school-level regressions of the PISA-based management index standardized using the overall distribution on each of the intermediate school outcomes (also standardized). All specifications include PISA school final weights and country fixed effects. School controls: school location (set of dummies for village, small town, town, city, and large city), student-teacher ratio, log of the number of students, ratio of computers connected to the web as a proxy for school resources, and share of government funding relative to total school funding. Student controls: gender, grade compared to modal grade of students taking the PISA exam in the country, an index of economic, social, and cultural status, and immigration status (set of dummies for native, first generation, and second generation). Panel B: PB exam is applied in public schools only. The table reports coefficients from school-level regressions of the PB-based management index standardized using the overall distribution on each of the intermediate school outcomes (also standardized). All specifications include year fixed effects. PISA-like controls are taken from PB data set and attempt to match school controls and student controls in PISA regressions (Table 1): indicator variable for urban schools, student-teacher ratio, log of the number of students, dummies indicating the presence of a computer lab and whether the school has internet access, gender, student households' consumption index, and a set of dummies for race. Given the availability of principal characteristics, PB controls include principals' age, set of dummies for principals' race, principals' educational attainment (set of dummies for less than high school, high school, undergraduate (pedagogy), undergraduate (math), undergraduate (Portuguese), undergraduate (others), masters, doctoral), indicator for whether the principal holds another job. PB controls also include the class-year-level share of white teachers, share of teachers holding a college degree, and average teacher tenure. For the students, PB controls include dummies for mother educational attainment (grades 1-5, grades 6-9, secondary grades 10-12, and college). In both panels: For control variables, missing variables are replaced with a value of -99 and we include an indicator variable with a value of 1 for each imputed value.

Table B.8: Management and school functioning: PCA

	Teachers						Households	
	(1) shortage	(2) shortage	(3) motivation	(4) motivation	(5) effort	(6) effort	(7) effort	(8) effort
PISA								
Management Index	-0.066	-0.064	0.261	0.283	0.042	0.074	0.211	0.242
	(0.025)	(0.024)	(0.027)	(0.025)	(0.026)	(0.025)	(0.031)	(0.030)
	[0.008]	[0.008]	[0.000]	[0.000]	[0.111]	[0.003]	[0.000]	[0.000]
Observations	10847	10847	10847	10847	10847	10847	10847	10847
Schools	10847	10847	10847	10847	10847	10847	10847	10847
R-Squared	0.035	0.055	0.072	0.112	0.014	0.068	0.060	0.132
Country FE	Y	Y	Y	Y	Y	Y	Y	Y
School Controls		Y		Y		Y		Y
Student Controls		Y		Y		Y		Y
Prova Brasil								
Management Index	-0.033	-0.080	0.327	0.360	0.087	0.041	0.125	0.063
	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	296610	296610	298011	298011	300137	300137	293873	293873
Schools	71556	71556	71462	71462	71711	71711	71320	71320
R-Squared	0.001	0.470	0.106	0.423	0.008	0.502	0.015	0.589
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
PISA-Like Controls		Y		Y		Y		Y
PB Controls		Y		Y		Y		Y
School FE		Y		Y		Y		Y

Note: Standard errors in parentheses, p-values in square brackets. Management index built using Principal Component Analysis. Panel A: All regressions use data from public schools only. The table reports coefficients from school-level regressions of the PISA-based management index standardized using the overall distribution on each of the intermediate school outcomes (also standardized). All specifications include PISA school final weights and country fixed effects. School controls: school location (set of dummies for village, small town, town, city, and large city), student-teacher ratio, log of the number of students, ratio of computers connected to the web as a proxy for school resources, and share of government funding relative to total school funding. Student controls: gender, grade compared to modal grade of students taking the PISA exam in the country, an index of economic, social, and cultural status, and immigration status (set of dummies for native, first generation, and second generation). Panel B: PB exam is applied in public schools only. The table reports coefficients from school-level regressions of the PB-based management index standardized using the overall distribution on each of the intermediate school outcomes (also standardized). All specifications include year fixed effects. PISA-like controls are taken from PB data set and attempt to match school controls and student controls in PISA regressions (Table 1): indicator variable for urban schools, student-teacher ratio, log of the number of students, dummies indicating the presence of a computer lab and whether the school has internet access, gender, student households' consumption index, and a set of dummies for race. Given the availability of principal characteristics, PB controls include principals' age, set of dummies for principals' race, principals' educational attainment (set of dummies for less than high school, high school, undergraduate (pedagogy), undergraduate (math), undergraduate (Portuguese), undergraduate (others), masters, doctoral), indicator for whether the principal holds another job. PB controls also include the class-year-level share of white teachers, share of teachers holding a college degree, and average teacher tenure. For the students, PB controls include dummies for mother educational attainment (grades 1-5, grades 6-9, secondary grades 10-12, and college). In both panels: For control variables, missing variables are replaced with a value of -99 and we include an indicator variable with a value of 1 for each imputed value.

C Appendix: Theoretical Framework

We first present a result that establishes effort levels in high and low management public schools, high management private schools, and the outside sector.

Lemma 1. *Assume that the government assigns the teacher to public school $i = L, H$.*

1. *If the teacher accepts the government's offer, then she exerts effort $e^i = \frac{\tau+\Delta^i}{2}$.*
2. *If the teacher declines the government's offer and is hired by a high management private school, then she exerts effort $e^P = \frac{\theta\, B}{2(\overline{\varepsilon}-\underline{\varepsilon})} + \frac{\tau+\Delta^H}{2}$.*
3. *If the teacher declines the government's offer and is hired by an outside employer, then she exerts effort $e^O = \frac{\theta\, \beta}{2(\overline{\varepsilon}-\underline{\varepsilon})}$.*

Proof. Part 1. When working in public school i, a teacher with baseline motivation τ chooses effort to solve

$$\max_e \; G - (e^2 - (\tau + \Delta^i) \cdot e).$$

Differentiation to obtain the first order condition yields the solution stated above. (Here, as in the cases below, the second order condition necessary for a maximum holds.)

Part 2. When working in a high management private school, a teacher with baseline motivation τ and ability θ chooses effort to solve

$$\max_e \; P \cdot B + W - (e^2 - (\tau + \Delta^H) \cdot e)$$

where P is the probability that y_1^H exceeds the threshold $\bar{y}$ given teacher and household effort. Using the uniform distribution for ε, we can rewrite this probability as

$$P = \Pr\left(\theta\; e + a + \varepsilon > \bar{y}\right) = \Pr\left(\theta\; e + a - \bar{y} > -\varepsilon\right) = \frac{\overline{\varepsilon} + \theta\; e + a - \bar{\bar{y}}}{\overline{\varepsilon} - \underline{\varepsilon}}.$$

The first order condition for this optimization problem is

$$\frac{\theta\; B}{\overline{\varepsilon} - \underline{\varepsilon}} = 2e - (\tau + \Delta^H),$$

which yields the solution stated above.

Part 3. When working in the outside sector, a teacher chooses effort to solve

$$\max_e \; P^O \cdot \beta - e^2,$$

where P^O is the probability that z exceeds the threshold $\bar{z}$ given effort. We can rewrite this probability as

$$P^O = \Pr\left(\theta\; e + \varepsilon^O > \overline{z}\right) = \Pr\left(\theta\; e - \overline{z} > -\varepsilon^O\right) = \frac{\overline{\varepsilon} + \theta\; e - \overline{z}}{\overline{\varepsilon} - \underline{\varepsilon}}.$$

The first order condition for this optimization problem is

$$\frac{\theta\; \beta}{\overline{\varepsilon} - \underline{\varepsilon}} = 2e,$$

which yields the solution stated above. □

We now use these effort levels to construct Figure 7. Calculations were performed in Mathematica; the notebook file is available on request.

Derivation of Figure 7 The figure is based on the following numerical example. Teacher intrinsic motivation is distributed $\tau \sim U[0, 10]$, and teacher ability is distributed $\theta \sim U[1, 5]$. In the low management public school $G^L = 30$, $\Delta^L = 0$, and $\gamma^L = 1$. In the high management public school, $G^H = 35$, $\Delta^H = 0.5$ and $\gamma^H = 2$. Other parameters are set at $W = 15$, $B = 40$, $\bar{y} = 4.5$, $\beta = 50$, and $\bar{z} = 1$.

The unshaded region in the top panel of Figure 7 shows $\mathcal{T}^H$, the set of (θ, τ) types for whom the payoff from accepting a job in the assigned high management public school (weakly) exceeds both the expected payoff of declining and accepting a job in a high management private school and the expected payoff of declining and accepting a job in the outside sector. This region is bounded by two functions

$$\tau_P^H = \frac{7}{\theta} - 2\theta - \tfrac{1}{2}, \quad \tau_O^H = \sqrt{25\theta^2 - 60} - \tfrac{1}{2}.$$

The function τ_P^H traces out the loci of (θ, τ) types who, anticipating subsequent teacher and household effort, are indifferent between accepting the job in the assigned high management public school and declining it in favour of a job in a high management private school, i.e. types for whom

$$G - (e^H)^2 + \left(\tau + \Delta^H\right)\, e^H = W + B\left(\frac{\overline{\varepsilon} + \theta\, e^P + a^P - \overline{y}}{\overline{\varepsilon} - \underline{\varepsilon}}\right) - (e^P)^2 + (\tau + \Delta^H)\, e^P.$$

Substituting for e^H and e^P from Lemma 1, together with the parameters in the numerical example (implying $a^P = 1$), and rearranging yields the expression for τ_P^H stated above. Fixing θ, for any $\tau < \tau_P^H(\theta)$, the teacher's payoff from accepting the government's offer is strictly higher than her expected payoff from declining and accepting a job in a high management private school.

The function τ_O^H traces out the loci of (θ, τ) types who, anticipating subsequent teacher effort, are indifferent between accepting the job in the assigned high management public school and declining it in favour of a job in the outside sector, i.e. types for whom

$$G - (e^H)^2 + (\tau + \Delta^H)\, e^H = \beta\left(\frac{\overline{\varepsilon} + \theta\, e^O - \overline{z}}{\overline{\varepsilon} - \underline{\varepsilon}}\right) - (e^O)^2.$$

Substituting for e^H and e^O from Lemma 1, together with the parameters in the numerical example, and rearranging for τ yields the expression for τ_O^H stated above. Fixing θ, for any $\tau > \tau_O^H(\theta)$, the teacher's payoff from accepting the government's offer is strictly higher than her expected payoff from declining and accepting a job in the outside sector.

The values for average ability and average baseline intrinsic motivation (the coordinates of the blue dot) are obtained by numerical integration.

The unshaded region in the bottom panel of Figure 7 shows $\mathcal{T}^L$, the set of (θ, τ) types for whom the payoff from accepting a job in the assigned low management public school (weakly) exceeds both the expected payoff of declining and accepting a job in a high management private school and the expected payoff of declining and accepting a job in the outside sector. This region is bounded

by two functions

$$\tau_P^L = \frac{36}{8\theta+1} - 2\theta - \tfrac{1}{4}, \quad \tau_O^L = \sqrt{25\theta^2 - 40}.$$

The function τ_P^L traces out the loci of (θ, τ) types who, anticipating subsequent teacher and household effort, are indifferent between accepting the job in the assigned low management public school and declining it in favour of a job in a high management private school, i.e. types for whom

$$G - (e^L)^2 + \left(\tau + \Delta^L\right)\, e^L = W + B\left(\frac{\overline{\varepsilon} + \theta\, e^P + a^P - \overline{y}}{\overline{\varepsilon} - \underline{\varepsilon}}\right) - (e^P)^2 + (\tau + \Delta^H)\, e^P.$$

Substituting for e^L and e^P from Lemma 1, together with the parameters in the numerical example (implying $a^P = 1$), and rearranging yields the expression for τ_P^L stated above. Fixing θ, for any $\tau < \tau_P^L(\theta)$, the teacher's payoff from accepting the government's offer is strictly higher than her expected payoff from declining and accepting a job in a high management private school.

The function τ_O^L traces out the loci of (θ, τ) types who, anticipating subsequent teacher effort, are indifferent between accepting the job in the assigned low management public school and declining it in favour of a job in the outside sector, i.e. types for whom

$$G - (e^L)^2 + (\tau + \Delta^L)\, e^L = \beta\left(\frac{\overline{\varepsilon} + \theta\, e^O - \overline{z}}{\overline{\varepsilon} - \underline{\varepsilon}}\right) - (e^O)^2.$$

Substituting for e^L and e^O from Lemma 1, together with the parameters in the numerical example, and rearranging for τ yields the expression for τ_O^L stated above. Fixing θ, for any $\tau > \tau_O^L(\theta)$, the teacher's payoff from accepting the government's offer is strictly higher than her expected payoff from declining and accepting a job in the outside sector.

The values for average ability and average baseline intrinsic motivation (the coordinates of the orange dot) are also obtained by numerical integration.

Low-cost private schools We complete the analysis by considering an alternative numerical example, where pay in a high management private school is *below* the level in both high and low management public schools. All parameters take the same values as in the previous numerical example, except $W = 5$ and $B = 20$. In this numerical example,

$$\tau_P^H = \frac{27}{\theta} - \theta - \tfrac{1}{2}, \quad \tau_O^H = \sqrt{25\theta^2 - 60} - \tfrac{1}{2}$$

and

$$\tau_P^L = \frac{88}{4\theta+1} - \theta - \tfrac{1}{4}, \quad \tau_O^L = \sqrt{25\theta^2 - 40}.$$

These functions are plotted in Figure 9. As before, the probability of hiring the teacher in a high management public school is higher than the probability of hiring the teacher in a low management public school (the unshaded region is larger in the top panel than in the bottom panel). The expected intrinsic motivation of a teacher hired to a high management public school is now slightly *lower* than the expected intrinsic motivation of a teacher hired to a low management public school (compare the height of the orange dot at 5.98 with the height of the blue dot at 5.81). The difference is small, however, and not sufficient to reverse the effort effect: the expected effort level of a teacher hired to a high management public school is higher than the expected intrinsic

motivation of a teacher hired to a low management public school ($\mathrm{E}\left[\frac{\tau+\Delta^H}{2}|(\theta,\tau)\in\mathcal{T}^H\right]=3.16>\mathrm{E}\left[\frac{\tau+\Delta^L}{2}|(\theta,\tau)\in\mathcal{T}^L\right]=2.99$). Household effort levels in public schools are unchanged.

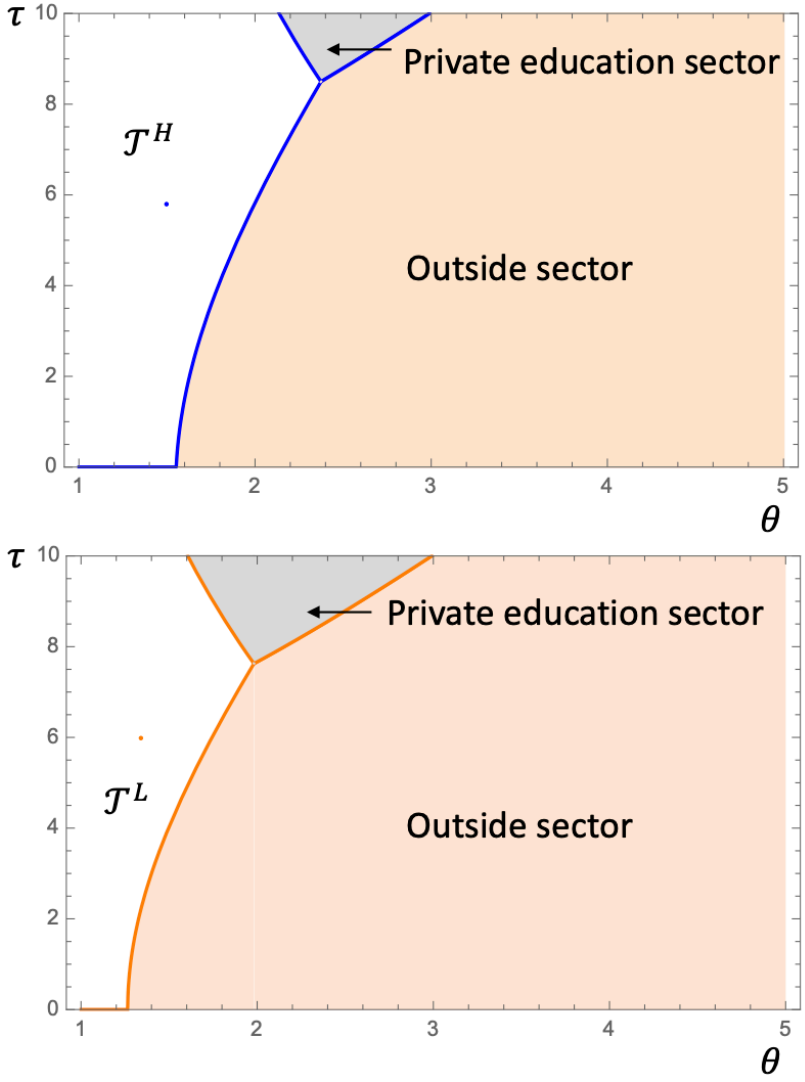


Figure C.1: Teacher selection, with 'low cost' private schools

Note: Teacher ability is distributed $\theta\sim U[1,5]$ and teacher intrinsic motivation is distributed $\tau\sim U[0,10]$. In the low management public school $G^L=30$, $\Delta^L=0$, and $\gamma^L=1$. In the high management public school, $G^H=35$, $\Delta^H=0.5$ and $\gamma^H=2$. Other parameters are set at $W=5$, $B=20$, $\bar{y}=4.5$, $\beta=50$, and $\bar{z}=1$. The blue point in the top panel shows average teacher ability and average baseline intrinsic motivation among teacher types who select into a high management public school. The (x,y)-coordinates are $(1.50,5.81)$. The orange point in the bottom panel shows average teacher ability and average baseline intrinsic motivation among teacher types who select into a low management public school. The (x,y)-coordinates are $(1.34,5.98)$.

D Construction of Indices

D.1 PISA

For each WMS topic, there is a scoring grid ranging from 1 (little to no structured management) to 5 (best practice), which serves as a guide to evaluate answers to questions during the interviews. The overall management index, which measures the level of adoption of structured management best practices, is simply the average of the scores for these 20 topics. A score between 1 to 2 refers to a school with practically no structured management practices or very weak management practices implemented; a score between 2 to 3 refers to a school with some informal practices implemented, but these practices consist mostly of a reactive approach to managing the school; a score between 3 to 4 refers to a school where a good, formal management process is in place (though not yet consistently enough) and these practices consist mostly of a proactive approach to managing a school; and a score between 4 to 5 refers to well-defined, strong processes in place which are often seen as best practices in education.

To construct a PISA-based school management index, we followed a four-step approach. First, we classified each of the 2012 PISA questions either under one of the WMS topics or under "not management". We were able to classify 53 2012 PISA questions into 14 WMS topics. Second, we manually assigned scores following the conceptual guidelines of the scoring grid of the World Management Survey, similar to the exercise conducted in the census-based management surveys such as the US Census Management and Organizational Practices Survey (MOPS), where values indicating best practices receive higher scores than values indicating poor practices. Values are normalized from 0 to 1.[18] Third, we compute a score for each of the 14 topics as the average of the questions we classified into each topic. These topic-level scores are then standardized using the within-country distributions of each topic. Fourth, to build the overall management index we follow three different procedures. In our main analysis, the overall management index is the average of the standardized score of the 14 topics. For robustness, we also compute an alternative index following Anderson (2008)[19]. Using this methodology yields similar results. We also build the indices following a principal components analysis, in which we considered the predicted value of the first component. Once again, results are similar to the main analysis.

Besides the management index and its sub-indices, we also constructed teacher shortage, teacher motivation, teacher effort, and household effort indices. The procedure here is analogous to the one for the management indices: first, we identify the PISA 2012 questions associated with each new index; second, we assign scores for each question; third, we standardize each question; fourth, the indices used in the main analysis are computed as the average of the questions that we mapped into each one them. As before, we also compute alternative indices using the Anderson methodology or running a principal components analysis, finding similar results.

The list of questions included in the PISA 2012 management index and its mapping to the individual questions is described below, as well as the list of questions mapped into each of the teacher shortage, teacher motivation, teacher effort, and household effort indices.

[18] MOPS has since been replicated in a number of other countries. Its questions follow the WMS topics and look to measure similar practices, but with self-reported answers.

[19] The methodology proposed by Anderson (2008) weights the impact of the included variables by the sum of their row in the inverse variance-covariance matrix, thereby assigning greater weight to questions that carry more "new information". Given that the importance (weight) of one questions is relative to the important of all others, we conservatively drop schools missing more than one management question (approximately 15% of schools are dropped, yet all countries are still included in the final sample).

PISA 2012				
Questions	**Var. name in questionnarie**	**Value label**	**Value**	**MGMT score**
1) Standardization of Instructional Processes				
Which of the following options describe what your school does for <national modal grade for 15-year-olds> students in mathematics classes? Answer: Mathematics classes study similar content, but at different levels of difficulty.	SC15Q01	All classes	1	0.00
		Some classes	2	0.50
		Not for any class	3	1.00
Which of the following options describe what your school does for <national modal grade for 15-year-olds> students in mathematics classes? Answer: Different classes study different content or sets of mathematics topics that have different levels of difficulty.	SC15Q02	All classes	1	0.00
		Some classes	2	0.50
		Not for any class	3	1.00
Which of the following measures aimed at quality assurance and improvement do you have in your school? Answer: Implementation of a standardised policy for mathematics (i.e. school curriculum with shared instructional materials accompanied by staff development and training).	SC39Q10	Yes	1	1.00
		No	2	0.00
Which of the following statements apply in your school? Answer: The school has a policy on how to use computers in mathematics instruction (e.g. amount of computer use in mathematics lessons, use of specific mathematics computer programs).	SC40Q01	Yes	1	1.00
		No	2	0.00
Which of the following statements apply in your school? Answer: All <national modal grade for 15-year-olds> mathematics classes in the school use the same textbook.	SC40Q02	Yes	1	1.00
		No	2	0.00
Which of the following statements apply in your school? Answer: Mathematics teachers in the school follow a standardised curriculum that specifies content at least on a monthly basis.	SC40Q03	Yes	1	1.00
		No	2	0.00
2) Personalization of Instruction and Learning				
Which of the following options describe what your school does for <national modal grade for 15-year-olds> students in mathematics classes? Answer: In mathematics classes, teachers use pedagogy suitable for students with heterogeneous abilities (i.e. students are not grouped by ability).	SC15Q04	All classes	1	1.00
		Some classes	2	0.50
		Not for any class	3	0.00
3) Data-Driven Planning and Student Transitions				
Are assessments of students in <national modal grade for 15-year-olds> used to inform parents about their child's progress?	SC18Q01	Yes	1	1.00
		No	2	0.00
Are assessments of students in <national modal grade for 15-year-olds> used to make decisions about students' retention or promotion?	SC18Q02	Yes	1	1.00
		No	2	0.00
Which of the following measures aimed at quality assurance and improvement do you have in your school? Answer: Systematic recording of data including teacher and student attendance and graduation rates, test results and professional development of teachers.	SC39Q03	Yes	1	1.00
		No	2	0.00
4) Adopting Educational Best Practices				
Are assessments of students in <national modal grade for 15-year-olds> used to identify aspects of instruction or the curriculum that could be improved?	SC18Q07	Yes	1	1.00
		No	2	0.00

PISA 2012				
Questions	**Var. name in questionnarie**	**Value label**	**Value**	**MGMT score**
4) Adopting Educational Best Practices				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I promote teaching practices based on recent educational research.	SC34Q05	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I set aside time at faculty meetings for teachers to share ideas or information from in-service activities.	SC34Q18	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
Which of the following measures aimed at quality assurance and improvement do you have in your school? Answer: Teacher mentoring.	SC39Q08	Yes	1	1.00
		No	2	0.00
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I lead or attend in-service activities concerned with instruction.	SC34Q17	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
5) Continuous Improvement				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: When a teacher has problems in his/her classroom, I take the initiative to discuss matters.	SC34Q07	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I engage teachers to help build a school culture of continuous improvement.	SC34Q11	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00

PISA 2012				
Questions	**Var. name in questionnarie**	**Value label**	**Value**	**MGMT score**
5) Continuous Improvement				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I conduct informal observations in classrooms on a regular basis (informal observations are unscheduled, last at least 5 minutes, and may or may not involve written feedback or a formal conference).	SC34Q19	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
Which of the following measures aimed at quality assurance and improvement do you have in your school? Answer: Internal evaluation/self-evaluation.	SC39Q05	Yes	1	1.00
		No	2	0.00
Which of the following measures aimed at quality assurance and improvement do you have in your school? Answer: External evaluation.	SC39Q06	Yes	1	1.00
		No	2	0.00
Which of the following measures aimed at quality assurance and improvement do you have in your school? Answer: Seeking written feed-back from students (e.g. regarding lessons, teachers or resources).	SC39Q07	Yes	1	1.00
		No	2	0.00
7) Performance Review				
During the last year, have any of the following methods been used to monitor the practice of mathematics teachers at your school? Answer: Tests or assessments of student achievement.	SC30Q01	Yes	1	1.00
		No	2	0.00
During the last year, have any of the following methods been used to monitor the practice of mathematics teachers at your school? Answer: Teacher peer review (of lesson plans, assessment instruments, lessons).	SC30Q02	Yes	1	1.00
		No	2	0.00
During the last year, have any of the following methods been used to monitor the practice of mathematics teachers at your school? Answer: Principal or senior staff observations of lessons.	SC30Q03	Yes	1	1.00
		No	2	0.00
During the last year, have any of the following methods been used to monitor the practice of mathematics teachers at your school? Answer: Observation of classes by inspectors or other persons external to the school.	SC30Q04	Yes	1	1.00
		No	2	0.00
8) Performance Dialogue				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I ask teachers to participate in reviewing management practices.	SC34Q12	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00

PISA 2012				
Questions	**Var. name in questionnarie**	**Value label**	**Value**	**MGMT score**
8) Performance Dialogue				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: When a teacher brings up a classroom problem, we solve the problem together.	SC34Q13	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I discuss academic performance results with the faculty to identify curricular strengths and weaknesses.	SC34Q16	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
10) Target Balance				
Are assessments of students in <national modal grade for 15-year-olds> used to compare the school to <district or national> performance?	SC18Q04	Yes	1	1.00
		No	2	0.00
Are assessments of students in <national modal grade for 15-year-olds> used to monitor the school's progress from year to year?	SC18Q05	Yes	1	1.00
		No	2	0.00
Are assessments of students in <national modal grade for 15-year-olds> used to compare the school with other schools?	SC18Q08	Yes	1	1.00
		No	2	0.00
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I make sure that the professional development activities of teachers are in accordance with the teaching goals of the school.	SC34Q03	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
11) Target Inter-Connection				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I discuss the school's academic goals with teachers at faculty meetings.	SC34Q14	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
13) Target Stretch				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I use student performance results to develop the school's educational goals.	SC34Q02	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00

PISA 2012				
Questions	**Var. name in questionnarie**	**Value label**	**Value**	**MGMT score**
14) Clarity and Comparability of Targets				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I ensure that teachers work according to the school's educational goals.	SC34Q04	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I refer to the school's academic goals when making curricular decisions with teachers.	SC34Q15	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
Which of the following measures aimed at quality assurance and improvement do you have in your school? Answer: Written specification of the school's curricular profile and educational goals.	SC39Q01	Yes	1	1.00
		No	2	0.00
Which of the following measures aimed at quality assurance and improvement do you have in your school? Answer: Written specification of student performance standards.	SC39Q02	Yes	1	1.00
		No	2	0.00
In your school, are achievement data used in any of the following <accountability procedures>? Answer: Achievement data are posted publicly (e.g. in the medi1).	SC19Q01	Yes	1	1.00
		No	2	0.00
In your school, are achievement data used in any of the following <accountability procedures>? Answer: Achievement data are tracked over time by an administrative authority.	SC19Q02	Yes	1	1.00
		No	2	0.00
15) Rewarding High Performers				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I evaluate the performance of staff.	SC34Q22	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
Are assessments of students in <national modal grade for 15-year-olds> used to make judgements about teachers' effectiveness?	SC18Q06	Yes	1	1.00
		No	2	0.00
To what extent have appraisals of and/or feedback to teachers directly led a change in salary?	SC31Q01	No change	1	0.00
		Small change	2	0.33
		Moderate change	3	0.66
		Large change	4	1.00
To what extent have appraisals of and/or feedback to teachers directly led a financial bonus or another kind of monetary reward?	SC31Q02	No change	1	0.00
		Small change	2	0.33
		Moderate change	3	0.66
		Large change	4	1.00
To what extent have appraisals of and/or feedback to teachers directly led a public recognition from you?	SC31Q05	No change	1	0.00
		Small change	2	0.33
		Moderate change	3	0.66
		Large change	4	1.00

PISA 2012				
Questions	**Var. name in questionnarie**	**Value label**	**Value**	**MGMT score**
15) Rewarding High Performers				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I praise teachers whose students are actively participating in learning.	SC34Q06	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
17) Promoting High Performers				
To what extent have appraisals of and/or feedback to teachers directly led to opportunities for professional development activities?	SC31Q03	No change	1	0.00
		Small change	2	0.33
		Moderate change	3	0.66
		Large change	4	1.00
To what extent have appraisals of and/or feedback to teachers directly led changes in work responsibilities that make the job more attractive?	SC31Q06	No change	1	0.00
		Small change	2	0.33
		Moderate change	3	0.66
		Large change	4	1.00
To what extent have appraisals of and/or feedback to teachers directly led a role in school development initiatives (e.g. curriculum development group, development of school objectives)?	SC31Q07	No change	1	0.00
		Small change	2	0.33
		Moderate change	3	0.66
		Large change	4	1.00
To what extent have appraisals of and/or feedback to teachers directly led a change in the likelihood of career advancement?	SC31Q04	No change	1	0.00
		Small change	2	0.33
		Moderate change	3	0.66
		Large change	4	1.00
20) Attracting Talent / Creating a Distinctive Employee Value Proposition				
Please indicate the frequency of the following activities and behaviours in your school during <the last academic year>. Answer: I work to enhance the school's reputation in the community.	SC34Q01	Did not occur	1	0.00
		1-2 times during the year	2	0.20
		3-4 times during the year	3	0.40
		Once a month	4	0.60
		Once a week	5	0.80
		More than once a week	6	1.00
What percentage of all staff in your school has attended a programme of professional development with a focus on mathematics?	SC35Q01	Percentage	0	0.00
			1-25	0.25
			26-50	0.50
			51-75	0.75
			76-100	1.00
What percentage of math teachers in your school has attended a programme of professional development with a focus on mathematics?	SC35Q02	Percentage	0	0.00
			1-25	0.25
			26-50	0.50
			51-75	0.75
			76-100	1.00

PISA 2012				
Questions	**Var. name in questionnarie**	**Value label**	**Value**	**MGMT score**
Teacher Shortage				
Is your school's capacity to provide instruction hindered by any of the following issues? Answer: A lack of qualified science teachers.	SC14Q01	Not al all	1	1
		Very little	2	2
		To some extent	3	3
		A lot	4	4
Is your school's capacity to provide instruction hindered by any of the following issues? Answer: A lack of qualified mathematics teachers.	SC14Q02	Not al all	1	1
		Very little	2	2
		To some extent	3	3
		A lot	4	4
Is your school's capacity to provide instruction hindered by any of the following issues? Answer: A lack of qualified <test language> teachers.	SC14Q03	Not al all	1	1
		Very little	2	2
		To some extent	3	3
		A lot	4	4
Is your school's capacity to provide instruction hindered by any of the following issues? Answer: A lack of qualified teachers of other subjects	SC14Q04	Not al all	1	1
		Very little	2	2
		To some extent	3	3
		A lot	4	4
Teacher Motivation				
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Teachers' low expectation of students.	SC22Q13	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Teachers not meeting individual students' needs.	SC22Q14	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Discussed their child's behavior on the initiative of one of their child's techers.	SC25Q02	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Discussed their child's progress on the initiative of one of their child's techers.	SC25Q04	Percentage		
Think about the teachers in your school. How much do you agree with the following statements? Answer: The morale of teachers in this school is high.	SC26Q01	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1
Think about the teachers in your school. How much do you agree with the following statements? Answer: Teachers work with enthusiams.	SC26Q02	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1
Think about the teachers in your school. How much do you agree with the following statements? Answer: Teachers take pride in this school.	SC26Q03	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1
Think about the teachers in your school. How much do you agree with the following statements? Answer: Teachers value academic achievement.	SC26Q04	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1
How much do you agree with these statements about teachers in your school? Answer: Mathematics teachers are interested in trying new methods and teaching practices.	SC27Q01	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1
How much do you agree with these statements about teachers in your school? Answer: There is a preference among mathematics teachers to stay with well-known methods and practices.	SC27Q02	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1
How much do you agree with these statements about teachers in your school? Answer: There is consensus among mathematics teachers that academic achievement must be kept as high as possible.	SC28Q01	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1

PISA 2012				
Questions	**Var. name in questionnarie**	**Value label**	**Value**	**MGMT score**
Teacher Motivation				
How much do you agree with these statements about teachers in your school? Answer: There is consensus among mathematics teachers that it is best to adapt academic standards to the students' levels and needs.	SC28Q02	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1
How much do you agree with these statements about teachers in your school? Answer: There is consensus among mathematics teachers that the social and emotional development of the students is as important as their acquisition of mathematical skills and knowledge in mathematics classes	SC29Q01	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1
How much do you agree with these statements about teachers in your school? Answer: There is consensus among mathematics teachers that the development of mathematical skills and knowledge in students is the most important objective in mathematics classes	SC29Q02	Strongly agree	1	4
		Agree	2	3
		Disagree	3	2
		Strongly disagree	4	1
Teacher Effort				
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Teacher absenteeism.	SC22Q15	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Teachers being too strict with students.	SC22Q17	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Teachers being late for classes.	SC22Q18	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
Household Effort				
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Student truancy.	SC22Q01	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Students skipping classes.	SC22Q02	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Students arriving late for school.	SC22Q03	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Students not attending compulsory school events (e.g. sports day) or excursions.	SC22Q04	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Students lacking respect for teachers.	SC22Q05	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Disruption of classes by students.	SC22Q06	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Students intimidating or bullying other students.	SC22Q08	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1

PISA 2012				
Questions	**Var. name in questionnarie**	**Value label**	**Value**	**MGMT score**
Household Effort				
In your school, to what extent is the learning of students hindered by the following phenomena? Answer: Poor student-teacher relations.	SC22Q10	Not al all	1	4
		Very little	2	3
		To some extent	3	2
		A lot	4	1
Which statement below best characterizes parental expectations towards your school?	SC24Q01	There is constant pressure from many parents, who expect our school to set very high academic standards and to have our students achieve them.	1	3
		Pressure on the school to achieve higher academic standards among students comes from a minority of parents.	2	2
		Pressure from parents on the school to achieve higher academic standards among students is largely absent.	3	1
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Discussed their child's behaviour with a teacher on their own initiative.	SC25Q01	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Discussed their child's progress with a teacher on their own initiative.	SC25Q03	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Volunteered in physical activities, e.g. building maintenance, carpentry, gardening or yard work.	SC25Q05	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Volunteered in extra-curricular activities, e.g. book club, school play, sports, field trip.	SC25Q06	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Volunteered in the school library or media centre.	SC25Q07	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Assisted a teacher in the school.	SC25Q08	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Appeared as a guest speaker.	SC25Q09	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Participated in local school <government>, e.g. parent council or school management committee.	SC25Q10	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Assisted in fundraising for the school.	SC25Q11	Percentage		
During <the last academic year>, what proportion of students' parents participated in the following school-related activities? Answer: Volunteered in the school <canteen>.	SC25Q12	Percentage		

D.2 Prova Brasil

The Prova Brasil-based school management index is based on a harmonized version of the Prova Brasil mapping across 2007 to 2017. We use questions from the three questionnaires in Prova Brasil: school director, teacher, and student questionnaires, which are merged together in a student-level data set with students from grades 5 and 9. We collapse this data set at the school-grade level. We then follow steps similar to the ones detailed in the construction of the PISA-based index.

First, using the combined Prova Brasil data set, 29 questions are classified into 5 WMS topics. Second, we manually assigned normalized scores from 0 to 1 following the conceptual guidelines of the scoring grid of the World Management Survey. Third, we compute a score for each of the 5 topics as the average of the questions we classified into each topic. These topic-level scores are then standardized using the within-year distributions of each topic. Fourth, in the main analysis, to build the grade-specific management index, we average the standardized score of the 5 topics.

At last, for schools offering both grade 5 and grade 9, the school-level management index is the average of the grade-specific scores. For schools offering just one of the two grades, the school-level management index is identical to the grade-specific score.

We also compute alternative indices following the Anderson methodology and a principal components analysis, finding similar results. We note that these alternative indices are constructed using within-year distributions of the questions.

Teacher shortage, teacher motivation, teacher effort, and household effort indices are constructed in a similar fashion. First, we identify the Prova Brasil questions associated with each index; second, we assign scores for each question; third, we standardize each question within year; fourth, the indices used in the main analysis are computed as the average of the questions that we mapped into each one them and averaged at the school-level for schools offering both grades. As before, we also compute alternative indices using the Anderson methodology or running a principal components analysis, finding similar results.

The WMS-Prova Brasil mapping is detailed below.

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
1) Standardisation of Instructional Processes								
2007-2009: Algumas afirmações são usadas para explicar as dificuldades de aprendizagem dos alunos. Assinale sua posição, considerando a situação dos alunos da(s) série(s) avaliada(s): Estão relacionadas ao não-cumprimento do conteúdo curricular. 2011: Assinale sua posição em relação às afirmações abaixo, que se referem aos possíveis problemas de aprendizagem dos alunos da(s) série(s) avaliada(s): estão relacionados ao não-cumprimento do conteúdo curricular. 2013-2017: Na sua percepção, os possíveis problemas de aprendizagem dos alunos das série(s) ou ano(s) avaliado(s) ocorrem, nesta escola, devido à/ao(s): Não cumprimento dos conteúdos curriculares ao longo da	***Teacher:*** TX_RESP_Q63 (2007) TX_RESP_Q67 (2009) TX_RESP_Q50 (2011) TX_RESP_Q73 (2013-2017)	A	Concordo	0.00	Concordo	0.00	Sim	0.00
		B	Discordo	1.00	Discordo	1.00	Não	1.00
2007-2009: Quanto dos conteúdos previstos você conseguiu desenvolver com os alunos da(s) turma(s) avaliada(s), neste ano? 2011: Quanto do conteúdo previsto você conseguiu desenvolver com os alunos desta turma neste ano? 2013-2017: Quanto do conteúdo previsto você conseguiu desenvolver com os alunos desta turma neste ano?	***Teacher:*** TX_RESP_Q55 (2007) TX_RESP_Q59 (2009) TX_RESP_Q121 (2011) TX_RESP_Q106 (2013-2017)	A	Menos de 40%.	0.00	Menos de 20%.	0.00	Menos de 20%.	0.00
		B	Entre 40% e 60%.	0.33	De 20% a menos de 40%.	0.33	De 20% a menos de 40%.	0.00
		C	Entre 60% e 80%.	0.66	De 40% a menos de 60%.	0.66	De 40% a menos de 60%.	0.33
		D	Mais de 80%.	1.00	De 60% a menos de 80%.	1.00	De 60% a menos de 80%.	0.66
		E	-	-	-	-	80% ou mais.	1.00
2007-2009: Os alunos da(s) turma(s) em que você leciona têm livros didáticos? 2011: Os alunos desta turma têm livros didáticos? 2013-2017: Os alunos desta turma têm livros didáticos?	***Teacher:*** TX_RESP_Q126 (2007) TX_RESP_Q130 (2009) TX_RESP_Q126 (2011) TX_RESP_Q99 (2013-2017)	A	Sim, todos têm.	1.00	Sim, todos têm.	1.00	Não, esta turma não recebeu o livro didático.	0.00
		B	Sim, a maioria tem.	0.75	Sim, a maioria tem.	0.75	Sim, menos da metade da turma tem.	0.25
		C	Sim, metade da turma tem.	0.50	Sim, metade da turma tem.	0.50	Sim, metade da turma tem.	0.50
		D	Sim, menos da metade da turma tem.	0.25	Sim, menos da metade da turma tem.	0.25	Sim, a maioria tem.	0.75
		E	Não, esta turma não recebeu o livro didático.	0.00	Não, esta turma não recebeu o livro didático. (passe para questão 129)	0.00	Sim, todos têm.	1.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
1) Standardisation of Instructional Processes								
2007-2009: Indique se você utiliza ou não nesta escola: jornais e revistas informativas. 2011: Indique se você utiliza ou não nesta escola: jornais e revistas informativas. 2013-2017: Gostaríamos de saber quais os recursos que você utiliza para fins pedagógicos, nesta turma: Jornais e revistas informativas.	***Teacher:*** TX_RESP_Q47 (2007-2009) TX_RESP_Q37 (2011) TX_RESP_Q44 (2013-2017)	A	Sim, utilizo.	1.00	Sim, utilizo.	1.00	Não utilizo porque a escola não tem.	0.00
		B	Não utilizo porque não acho necessário.	0.00	Não utilizo porque não acho necessário.	0.00	Nunca.	0.00
		C	Não utilizo porque a escola não tem.	0.00	Não utilizo porque a escola não tem.	0.00	De vez em quando.	0.50
		D	-	-	-	-	Sempre ou quase sempre.	1.00
2007-2009: Indique se você utiliza ou não nesta escola: livros de literatura em geral. 2011: Indique se você utiliza ou não nesta escola: livros de literatura em geral. 2013-2017: Gostaríamos de saber quais os recursos que você utiliza para fins pedagógicos, nesta turma: livros de literatura em geral.	***Teacher:*** TX_RESP_Q49 (2007) TX_RESP_Q50 (2009) TX_RESP_Q38 (2011) TX_RESP_Q45 (2013-2017)	A	Sim, utilizo.	1.00	Sim, utilizo.	1.00	Não utilizo porque a escola não tem.	0.00
		B	Não utilizo porque não acho necessário.	0.00	Não utilizo porque não acho necessário.	0.00	Nunca.	0.00
		C	Não utilizo porque a escola não tem.	0.00	Não utilizo porque a escola não tem.	0.00	De vez em quando.	1.00
		D	-	-	-	-	Sempre ou quase sempre.	1.00
2) Personalization of Instruction and Learning								
2007-2009: Algumas afirmações são usadas para explicar as dificuldades de aprendizagem dos alunos. Assinale sua posição, considerando a situação dos alunos da(s) série(s) avaliada(s): Estão relacionadas aos conteúdos curriculares, que são inadequados às necessidades dos alunos. 2011: Assinale sua posição em relação às afirmações abaixo, que se referem aos possíveis problemas de aprendizagem dos alunos da(s) série(s) avaliada(s): estão relacionados aos conteúdos curriculares, que são inadequados às necessidades dos alunos. 2013-2017: Na sua percepção, os possíveis problemas de aprendizagem dos alunos das série(s) ou ano(s) avaliado(s) ocorrem, nesta escola, devido à/ao(s): Conteúdos curriculares inadequados às necessidades dos alunos.	***Teacher:*** TX_RESP_Q60 (2007) TX_RESP_Q66 (2009) TX_RESP_Q49 (2011) TX_RESP_Q72 (2013-2017)	A	Concordo	0.00	Concordo	0.00	Sim	0.00
		B	Discordo	1.00	Discordo	1.00	Não	1.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
2) Personalization of Instruction and Learning								
2007-2009: Para evitar que os alunos faltem às aulas, os professores falam com os alunos. 2011: Para evitar que os alunos faltem às aulas, os professores falam com os alunos. 2013-2017: Indique com qual frequência são desenvolvidas as seguintes atividades para minimizar as faltas dos alunos neste ano e nesta escola: Os professores conversam com os alunos para tentar solucionar o problema.	Principal: TX_RESP_Q38 (2007) TX_RESP_Q038 (2009-2011) TX_RESP_Q045 (2013-2017)	A	Sim	1.00	Sim	1.00	Nunca.	0.00
		B	Não	0.00	Não	0.00	Algumas vezes.	1.00
		C	-	-	-	-	Frequentemente.	1.00
		D	-	-	-	-	Sempre ou quase sempre.	1.00
2007-2009: Para evitar que os alunos faltem às aulas, os pais/responsáveis são avisados por comunicação escrita. 2011: Para evitar que os alunos faltem às aulas, os pais/responsáveis são avisados por comunicação escrita. 2013-2017: Indique com qual frequência são desenvolvidas as seguintes atividades para minimizar as faltas dos alunos neste ano e nesta escola: Os pais/responsáveis são avisados por comunicação da escola.	Principal: TX_RESP_Q39 (2007) TX_RESP_Q039 (2009-2011) TX_RESP_Q046 (2013-2017)	A	Sim	1.00	Sim	1.00	Nunca.	0.00
		B	Não	0.00	Não	0.00	Algumas vezes.	1.00
		C	-	-	-	-	Frequentemente.	1.00
		D	-	-	-	-	Sempre ou quase sempre.	1.00
2007-2009: Para evitar que os alunos faltem às aulas, os pais/responsáveis são chamados à escola para conversar sobre o assunto em reunião de pais. 2011: Para evitar que os alunos faltem às aulas, os pais/responsáveis são chamados à escola para conversar sobre o assunto em reunião de pais. 2013-2017: Indique com qual frequência são desenvolvidas as seguintes atividades para minimizar as faltas dos alunos neste ano e nesta escola: Os pais/responsáveis são chamados à escola para conversar sobre o assunto em reunião de pais.	Principal: TX_RESP_Q40 (2007) TX_RESP_Q040 (2009-2011) TX_RESP_Q047 (2013-2017)	A	Sim	1.00	Sim	1.00	Nunca.	0.00
		B	Não	0.00	Não	0.00	Algumas vezes.	1.00
		C	-	-	-	-	Frequentemente.	1.00
		D	-	-	-	-	Sempre ou quase sempre.	1.00
2007-2009: Para evitar que os alunos faltem às aulas, os pais/responsáveis são chamados à escola para conversar sobre o assunto individualmente. 2011: Para evitar que os alunos faltem às aulas, os pais/responsáveis são chamados à escola para conversar sobre o assunto individualmente. 2013-2017: Indique com qual frequência são desenvolvidas as seguintes atividades para minimizar as faltas dos alunos neste ano e nesta escola: Os pais/responsáveis são chamados à escola para conversar sobre o assunto individualmente.	Principal: TX_RESP_Q41 (2007) TX_RESP_Q041 (2009-2011) TX_RESP_Q048 (2013-2017)	A	Sim	1.00	Sim	1.00	Nunca.	0.00
		B	Não	0.00	Não	0.00	Algumas vezes.	1.00
		C	-	-	-	-	Frequentemente.	1.00
		D	-	-	-	-	Sempre ou quase sempre.	1.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
2) Personalization of Instruction and Learning								
2007-2009: Para evitar que os alunos faltem às aulas, a escola envia alguém à casa do aluno. 2011: Para evitar que os alunos faltem às aulas, a escola envia alguém à casa do aluno. 2013-2017: Indique com qual frequência são desenvolvidas as seguintes atividades para minimizar as faltas dos alunos neste ano e nesta escola: A escola envia alguém à casa do aluno.	Principal: TX_RESP_Q42 (2007) TX_RESP_Q042 (2009-2011) TX_RESP_Q049 (2013-2017)	A	Sim	1.00	Sim	1.00	Nunca.	0.00
		B	Não	0.00	Não	0.00	Algumas vezes.	1.00
		C	-	-	-	-	Frequentemente.	1.00
		D	-	-	-	-	Sempre ou quase sempre.	1.00
Como se deu a escolha do livro didático neste ano?	Principal: TX_RESP_Q94 (2007) TX_RESP_Q097 (2009) TX_RESP_Q128 (2011) TX_RESP_Q086 (2013-2017)	A	A equipe de professores da disciplina correspondente.	0.75	A equipe de professores da disciplina correspondente.	0.75	Não sei.	0.00
		B	O coordenador pedagógico, orientador educacional e eu, depois de consultarmos a equipe de professores da disciplina correspondente.	0.50	O coordenador pedagógico, orientador educacional e eu, depois de consultarmos a equipe de professores da disciplina correspondente.	0.50	Foi escolhido de forma participativa pelos professores.	1.00
		C	O coordenador pedagógico ou orientador educacional escolheu sozinho.	0.25	O coordenador pedagógico ou orientador educacional escolheu sozinho.	0.25	Foi escolhido por somente alguns membros da equipe escolar.	0.50
		D	Eu escolhi sozinho.	0.25	Eu escolhi sozinho.	0.25	Foi escolhido por órgãos externos à escola.	0.50
		E	Órgãos de gerência externa à escola.	0.25	Órgãos de gerência externa à escola.	0.25	Foi escolhido de outra maneira.	NA
		G	Não sei.	0.00	Não sei.	0.00	-	-

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
2) Personalization of Instruction and Learning								
2007-2011: Quanto ao projeto pedagógico desta escola neste ano (marque apenas uma opção) 2013-2017: Neste ano e nesta escola, como se deu a elaboração do Projeto Pedagógico?	Principal: TX_RESP_Q30 (2007-2011) TX_RESP_Q32 (2013-2017)	A	O modelo encaminhado pela secretaria da educação.	0.00	O modelo encaminhado pela secretaria da educação.	0.00	Não sei como foi desenvolvido.	NA
		B	Foi elaborado por mim.	0.50	Foi elaborado por mim.	0.50	Não existe Projeto Pedagógico.	0.00
		C	Depois de eu ter elaborado uma proposta do projeto, apresentei-a aos professores para sugestões e só depois escrevi a versão final.	1.00	Depois de eu ter elaborado uma proposta do projeto, apresentei-a aos professores para sugestões e só depois escrevi a versão final.	1.00	Utilizando-se um modelo pronto, sem discussão com a equipe escolar.	0.00
		D	Os professores elaboraram uma proposta e, com base nela, escrevi a versão final.	1.00	Os professores elaboraram uma proposta e, com base nela, escrevi a versão final.	1.00	Utilizando-se um modelo pronto, mas com discussão com a equipe escolar.	1.00
		E	Uma equipe de professores e eu elaboramos o projeto.	1.00	Uma equipe de professores e eu elaboramos o projeto.	1.00	Utilizando-se um modelo pronto, porém com adaptações, sem discussão com a equipe escolar.	0.50
		F	Foi elaborado de outra maneira.	NA	Uma equipe de professores e eu elaboramos o projeto.	1.00	Utilizando-se um modelo pronto, porém com adaptações e com discussão com a equipe escolar.	1.00
		G	Não sei como foi desenvolvido.	NA	Foi elaborado de outra maneira.	NA	Elaborou-se um modelo próprio, mas não houve discussão com a equipe escolar.	0.50

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
2) Personalization of Instruction and Learning								
		H	Não existe Projeto Pedagógico.	0.00	Não sei como foi desenvolvido.	NA	Elaborou-se um modelo próprio e houve discussão com a equipe escolar.	1.00
		I	-	-	Não existe Projeto Pedagógico.	0.00	-	-
2007-2009: Como foi desenvolvido o projeto pedagógico desta escola neste ano? 2011: Como foi desenvolvido o projeto pedagógico desta escola neste ano? (marque apenas uma opção) 2013-2017: Neste ano e nesta escola, como se deu a elaboração do Projeto Pedagógico?	Teacher: TX_RESP_Q53 (2007) TX_RESP_Q55 (2009) TX_RESP_Q42 (2011) TX_RESP_Q51 (2013-2017)	A	Pela aplicação de modelo encaminhado pela Secretaria de Educação.	0.00	Pela aplicação de modelo encaminhado pela Secretaria de Educação.	0.00	Não sei como foi desenvolvido.	NA
		B	Foi elaborado pelo(a) diretor(a).	0.50	Foi elaborado pelo(a) diretor(a).	0.50	Não existe Projeto Pedagógico.	0.00
		C	O(A) diretor(a) elaborou uma proposta de projeto, apresentou-a aos professores para sugestões e depois chegou à versão final.	1.00	O(A) diretor(a) elaborou uma proposta de projeto, apresentou-a aos professores para sugestões e depois chegou à versão final.	1.00	Utilizando-se um modelo pronto, sem discussão com a equipe escolar.	0.00
		D	Os professores elaboraram uma proposta e, com base nela, o diretor chegou à versão final.	1.00	Os professores elaboraram uma proposta e, com base nela, o diretor chegou à versão final.	1.00	Utilizando-se um modelo pronto, mas com discussão com a equipe escolar.	1.00
		E	Foi elaborado pelo(a) diretor(a) e por uma equipe de professores.	1.00	Foi elaborado pelo(a) diretor(a) e por uma equipe de professores.	1.00	Utilizando-se um modelo pronto, porém com adaptações, sem discussão com a equipe escolar.	0.50

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
2) Personalization of Instruction and Learning								
		F	De outra maneira.	NA	De outra maneira.	NA	Utilizando-se um modelo pronto, porém com adaptações e com discussão com a equipe escolar.	1.00
		G	Não sei como foi desenvolvido.	NA	Não sei como foi desenvolvido.	NA	Elaborou-se um modelo próprio, mas não houve discussão com a equipe escolar.	0.50
		H	Não existe Projeto Pedagógico.	0.00	Não existe Projeto Pedagógico.	0.00	Elaborou-se um modelo próprio e houve discussão com a equipe escolar.	1.00
3) Data-Driven Planning and Student Transitions								
2007-2009: Neste ano, qual foi o critério mais importante para a atribuição das turmas de 1.ª a 4.ª séries do ensino fundamental aos professores? 2011: Neste ano, qual foi o critério mais importante para a atribuição das turmas de 1.ª a 4.ª séries do ensino fundamental aos professores? 2013-2017: Neste ano, qual foi o principal critério para a atribuição das turmas aos professores?	Principal: TX_RESP_Q34 (2007) TX_RESP_Q034 (2009-2011) TX_RESP_Q040 (2013-2017)	A	Esta escola não oferece 1.ª a 4.ª séries do ensino fundamental.	missing	Esta escola não oferece 1.ª a 4.ª séries do ensino fundamental.	missing	Preferência dos professores.	0.00
		B	Preferência dos professores.	0.00	Preferência dos professores.	0.00	Escolha dos professores, de acordo com a pontuação por tempo de serviço e formação.	0.00
		C	Professores experientes com turmas de aprendizagem mais rápida.	1.00	Professores experientes com turmas de aprendizagem mais rápida.	1.00	Professores experientes com turmas de aprendizagem mais rápida.	1.00
		D	Professores experientes com turmas de aprendizagem mais lenta.	1.00	Professores experientes com turmas de aprendizagem mais lenta.	1.00	Professores experientes com turmas de aprendizagem mais lenta.	1.00
		E	Manutenção do professor com a mesma turma.	0.00	Manutenção do professor com a mesma turma.	0.00	Manutenção do professor com a mesma turma.	0.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
3) Data-Driven Planning and Student Transitions								
		F	Revezamento dos professores entre as séries.	0.00	Revezamento dos professores entre as séries.	0.00	Revezamento dos professores entre as séries	0.00
		G	Sorteio das turmas entre os professores	0.00	Sorteio das turmas entre os professores	0.00	Sorteio das turmas entre os professores	0.00
		H	Outro critério	missing	Outro critério	missing	Atribuição pela direção da escola	missing
		I	Não houve critério pré-estabelecido	0.00	Não houve critério pré-estabelecido	0.00	Outro critério	missing
		J					Não houve critério	missin
2007-2011: Qual o critério utilizado para formação das turmas nesta escola? 2013-2017: Neste ano, qual foi o principal critério utilizado para a formação das turmas nesta escola?	Principal: TX_RESP_Q33 (2007-2011) TX_RESP_Q39 (2013-2017)	A	Homogeneidade quanto à idade (alunos com a mesma idade).	0.50	Homogeneidade quanto à idade (alunos com a mesma idade).	0.50	Homogeneidade quanto à idade (alunos com a mesma idade).	0.50
		B	Homogeneidade quanto ao rendimento escolar (alunos com similar rendimento).	1.00	Homogeneidade quanto ao rendimento escolar (alunos com similar rendimento).	1.00	Homogeneidade quanto ao rendimento escolar (alunos com similar rendimento).	1.00
		C	Heterogeneidade quanto à idade (alunos com idades diferentes).	0.50	Heterogeneidade quanto à idade (alunos com idades diferentes).	0.50	Heterogeneidade quanto à idade (alunos com idades diferentes).	0.50
		D	Heterogeneidade quanto ao rendimento escolar (alunos com nível de rendimento diferente).	1.00	Heterogeneidade quanto ao rendimento escolar (alunos com nível de rendimento diferente).	1.00	Heterogeneidade quanto ao rendimento escolar (alunos com nível de rendimento diferente).	1.00
		E	Não houve critério.	0.00	Não houve critério.	0.00	Outro critério.	NA
		F	-	-	-	-	Não houve critério.	-

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
3) Data-Driven Planning and Student Transitions								
2007-2009: Nesta escola, há algum programa de redução das taxas de abandono/evasão? 2011-2017: Nesta escola, há algum programa de redução das taxas de abandono?	Principal: TX_RESP_Q36 (2007-2011) TX_RESP_Q41 (2013-2017)	A	Sim, e o programa está sendo aplicado.	1.00	Sim, e o programa está sendo aplicado.		Não há ação, embora exista o problema.	0.00
		B	Sim, mas ainda não foi implementado.	1.00	Sim, mas ainda não foi implementado.		Não há ação, porque nesta escola não há esse tipo de problema.	0.00
		C	Não criamos ainda o programa, embora exista o problema.	0.00	Não criamos ainda o programa, embora exista o problema.		Sim, mas com resultados ainda insatisfatórios.	1.00
		D	Não, porque na minha escola não há esse tipo de problema.	0.00	Não, porque na minha escola não há esse tipo de problema.		Sim, com resultados satisfatórios.	1.00
		E	-	-	-	-	Sim, mas ainda não avaliamos o resultado.	1.00
2007-2011: Nesta escola, há algum programa de redução das taxas de reprovação? 2013-2017: Nesta escola, há alguma ação para redução das taxas de reprovação?	Principal: TX_RESP_Q37 (2007-2011) TX_RESP_Q42 (2013-2017)	A	Sim, e o programa está sendo aplicado.	1.00	Sim, e o programa está sendo aplicado.		Não há ação, embora exista o problema.	0.00
		B	Sim, mas ainda não foi implementado.	1.00	Sim, mas ainda não foi implementado.		Não há ação, porque nesta escola não há esse tipo de problema.	0.00
		C	Não criamos ainda o programa, embora exista o problema.	0.00	Não criamos ainda o programa, embora exista o problema.		Sim, mas com resultados ainda insatisfatórios.	1.00
		D	Não, porque na minha escola não há esse tipo de problema.	0.00	Não, porque na minha escola não há esse tipo de problema.		Sim, com resultados satisfatórios.	1.00
		E	-	-	-	-	Sim, mas ainda não avaliamos o resultado.	1.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
3) Data-Driven Planning and Student Transitions								
2007-2011: Esta escola desenvolve, regularmente, algum programa de apoio ou reforço de aprendizagem para os alunos (monitoria, aula de reforço etc.)? 2013-2017: Nesta escola, há alguma ação para o reforço escolar à aprendizagem dos alunos (monitoria, aula de reforço, recuperação etc.)?	Principal: TX_RESP_Q43 (2007-2017)	-	Não	0.00	Não	0.00	Não	0.00
		-	Sim	1.00	Sim	1.00	Sim	1.00
4) Adopting Educational Best Practices								
2007-2009: Você promoveu alguma atividade de formação continuada (atualização, treinamento, capacitação etc.) Nesta escola? 2011: Você promoveu alguma atividade de formação continuada (atualização, treinamento, capacitação etc.) Nesta escola? 2013-2017: Nos últimos dois anos, você organizou alguma atividade de formação continuada (atualização, treinamento, capacitação etc.) nesta escola?	Principal: TX_RESP_Q22 (2007) TX_RESP_Q022 (2009-2011) TX_RESP_Q026 (2013-2017)	A	Sim	1.00	Sim	1.00	Não	0.00
		B	Não. (passe para a Q24)	0.00	Não. (passe para a Q24)	0.00	Sim	1.00
2007-2009: Qual foi a proporção de docentes da sua escola que participou das atividades de formação continuada promovidas por você nos últimos dois anos? 2011: Qual foi a proporção de docentes da sua escola que participou das atividades de formação continuada promovidas por você nos últimos dois anos? 2013-2017: Qual foi a quantidade de docentes desta escola que participou das atividades de formação continuada que você organizou nos últimos dois anos?	Principal: TX_RESP_Q23 (2007) TX_RESP_Q023 (2009-2011) TX_RESP_Q027 (2013-2017)	-	* If missing & Q22 = (B) Não. (passe para a Q24)	0.00	-	-	-	-
		A	Menos de 10%.	0.33	Menos de 10%.	0.33	Não foram organizadas atividades de formação continuada	0.00
		B	Entre 11% e 30%.	0.33	Entre 11% e 30%.	0.33	Poucos professores.	0.33
		C	Entre 31% e 50%.	0.66	Entre 31% e 50%.	0.66	Um pouco menos da metade dos professores.	0.66
		D	Mais de 51%.	1.00	Mais de 51%.	1.00	Um pouco mais da metade dos professores.	1.00
		E	Não sei.	NA	Não sei.	NA	Quase todos ou todos os professores.	1.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
4) Adopting Educational Best Practices								
2007-2009: Indique seu grau de concordância/discordância com cada uma delas: O(a) diretor(a) estimula as atividades inovadoras. 2011: Indique seu grau de concordância/discordância com cada uma delas. (marque apenas uma opção em cada linha.): o(a) diretor(a) estimula as atividades inovadoras. 2013-2017: Nesta escola e neste ano, indique a frequência com que: O(A) diretor(a) estimula atividades inovadoras.	***Teacher:*** TX_RESP_Q76 (2007) TX_RESP_Q80 (2009) TX_RESP_Q63 (2011) TX_RESP_Q65 (2013-2017)	A	Concordo totalmente	1.00	Concordo totalmente	1.00	Nunca.	0.00
		B	Concordo	1.00	Concordo	1.00	Algumas vezes.	0.00
		C	Neutro	0.00	Neutro	0.00	Frequentemente.	1.00
		D	Discordo	0.00	Discordo	0.00	Sempre ou quase sempre.	1.00
		E	Discordo totalmente	0.00	Discordo totalmente	0.00	-	-
2007-2009: Indique seu grau de concordância/discordância com cada uma delas: O(a) diretor(a) dá atenção especial a aspectos relacionados com a aprendizagem dos alunos. 2011: Indique seu grau de concordância/discordância com cada uma delas. (marque apenas uma opção em cada linha.): O(a) diretor(a) dá atenção especial a aspectos relacionados com a aprendizagem dos alunos. 2013-2017: Nesta escola e neste ano, indique a frequência com que: O(a) diretor(a) dá atenção especial a aspectos relacionados com a aprendizagem dos alunos.	***Teacher:*** TX_RESP_Q77 (2007) TX_RESP_Q81 (2009) TX_RESP_Q64 (2011) TX_RESP_Q61 (2013-2017)	A	Concordo totalmente	1.00	Concordo totalmente	1.00	Nunca.	0.00
		B	Concordo	1.00	Concordo	1.00	Algumas vezes.	0.00
		C	Neutro	0.00	Neutro	0.00	Frequentemente.	1.00
		D	Discordo	0.00	Discordo	0.00	Sempre ou quase sempre.	1.00
		E	Discordo totalmente	0.00	Discordo totalmente	0.00		
7) Performance Review								
2007-2011: Conselho de escola é um colegiado constituído por representantes da escola e da comunidade que tem como objetivo acompanhar as atividades escolares. Neste ano, quantas vezes o conselho desta escola se reuniu? 2013-2017: O Conselho Escolar é um colegiado geralmente constituído por representantes da escola e da comunidade que tem como objetivo acompanhar as atividades escolares. Neste ano, quantas vezes se reuniu o Conselho Escolar?	***Principal:*** TX_RESP_Q24 (2007-2011) TX_RESP_Q29 (2013-2017)	A	Uma vez.	0.33	Uma vez.	0.33	Não existe	0.00
		B	Duas vezes.	0.66	Duas vezes.	0.66	Nenhuma vez.	0.00
		C	Três vezes ou mais.	1.00	Três vezes ou mais.	1.00	Uma vez.	0.33
		D	Nenhuma vez.	0.00	Nenhuma vez.	0.00	Duas vezes.	0.66
		E	Não existe Conselho de Escola. (Passe para a Q29)	0.00	Não existe Conselho de Escola. (Passe para a Q29)	0.00	Três vezes ou mais.	1.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
7) Performance Review								
2007-2011: Conselho de classe é um órgão formado por todos os professores que lecionam em cada turma/série. Neste ano, quantas vezes se reuniram os conselhos de classe desta escola? 2013-2017: O Conselho de Classe é um orgão formado por todos os professores que lecionam em cada turma/série. Neste ano e nesta escola, quantas vezes se reuniu o Conselho de Classe?	Principal: TX_RESP_Q29 (2007) TX_RESP_Q029 (2009-2011) TX_RESP_Q031 (2013-2017)	A	Uma vez.	0.33	Uma vez.	0.25	Não existe Conselho de Classe nesta escola.	0.00
		B	Duas vezes.	0.66	Duas vezes.	0.25	Nenhuma vez.	0.00
		C	Três vezes ou mais.	1.00	Três vezes ou mais.	0.50	Uma vez.	0.33
		D	Nenhuma vez.	0.00	Nenhuma vez.	0.00	Duas vezes.	0.66
		E	Não existe Conselho de Classe.	0.00	Não existe Conselho de Classe.	0.00	Três vezes ou mais.	1.00
2007-2011: O conselho de escola é composto por alunos. (marque sim ou não em cada linha) 2013-2017: Além de você, quem participa do Conselho Escolar?	***Principal:*** TX_RESP_Q26 (2007-2011) TX_RESP_Q30 (2013-2017)	-	* If missing & Q24 = (E) Não existe Conselho de Escola. (Passe para a Q29)	0.00	* If missing & Q24 = (E) Não existe Conselho de Escola. (Passe para a Q29)	0.00	-	-
		A	Sim	1.00	Uma vez.	0.33	Não existe Conselho Escolar.	0.00
		B	Não	0.00	Duas vezes.	0.66	Professores, funcionários, alunos e pais/responsáveis.	1.00
		C	-	-	-	1.00	Professores, funcionários e pais/responsáveis.	0.00
		D	-	-		0.00	Professores,	1.00
		E	-	-	-	0.00	Professores,	1.00
		F	-	-	-	-	Professores e	0.00
		G	-	-	-	-	Outros.	0.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
7) Performance Review								
2007-2011: O conselho de escola é composto por pais. (marque sim ou não em cada linha) 2013-2017: Além de você, quem participa do Conselho Escolar?	***Principal:*** TX_RESP_Q28 (2007-2011) TX_RESP_Q30 (2013-2017)	-	* If missing & Q24 = (E) Não existe Conselho de Escola. (Passe para a Q29)	0.00	* If missing & Q24 = (E) Não existe Conselho de Escola. (Passe para a Q29)	0.00	-	-
		A	Sim	1.00	Uma vez.	0.33	Não existe Conselho Escolar.	0.00
		B	Não	0.00	Duas vezes.	0.66	Professores, funcionários, alunos e pais/responsáveis.	1.00
		C	-	-	-	1.00	Professores, funcionários e pais/responsáveis.	0.00
		D	-	-		0.00	Professores, alunos e pais/responsáveis.	1.00
		E	-	-	-	0.00	Professores, funcionários e alunos.	1.00
		F	-	-	-	-	Professores e pais/responsáveis.	0.00
		G	-	-	-	-	Outros.	0.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
7) Performance Review								
2007-2011: O conselho de escola é composto por funcionários. (marque sim ou não em cada linha) 2013-2017: Além de você, quem participa do Conselho Escolar?	***Principal:*** TX_RESP_Q27 (2007-2011) TX_RESP_Q30 (2013-2017)	-	* If missing & Q24 = (E) Não existe Conselho de Escola. (Passe para a Q29)	0.00	* If missing & Q24 = (E) Não existe Conselho de Escola. (Passe para a Q29)	0.00	-	-
		A	Sim	1.00	Uma vez.	0.33	Não existe Conselho Escolar.	0.00
		B	Não	0.00	Duas vezes.	0.66	Professores, funcionários, alunos e pais/responsáveis.	1.00
		C	-	-	-	1.00	Professores, funcionários e pais/responsáveis.	0.00
		D	-	-		0.00	Professores, alunos e pais/responsáveis.	1.00
		E	-	-	-	0.00	Professores, funcionários e alunos.	1.00
		F	-	-	-	-	Professores e pais/responsáveis.	0.00
		G	-	-	-	-	Outros.	0.00
2007-2011: Conselho de classe é um órgão formado por todos os professores que lecionam em cada turma/série. Neste ano, quantas vezes se reuniram os conselhos de classe desta escola? 2013-2017: O Conselho de Classe é um órgão formado por todos os professores que lecionam em cada turma/série. Neste ano e nesta escola, quantas vezes se reuniu o Conselho de Classe?	***Teacher:*** TX_RESP_Q54 (2007) TX_RESP_Q56 (2009) TX_RESP_Q43 (2011) TX_RESP_Q52 (2013-2017)	A	Uma vez.	0.33	Uma vez.	0.33	Não existe Conselho de Classe nesta escola.	0.00
		B	Duas vezes.	0.66	Duas vezes.	0.66	Nenhuma vez.	0.00
		C	Três vezes ou mais.	1.00	Três vezes ou mais.	1.00	Uma vez.	0.33
		D	Nenhuma vez.	0.00	Nenhuma vez.	0.00	Duas vezes.	0.66
		E	Não existe Conselho de Classe.	0.00	Não existe Conselho de Classe.	0.00	Três vezes ou mais.	1.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
Teacher Shortage								
2007-2011: Ocorreu na escola inexistência de professores para algumas disciplinas ou séries? 2013-2017: O funcionamento da escola foi dificultado por algum dos seguintes problemas? Inexistência de professores para algumas disciplinas ou séries.	***Principal:*** TX_RESP_Q45 (2007) TX_RESP_Q47 (2009) TX_RESP_Q56 (2011) TX_RESP_Q68 (2013-2017)	A	Não	0.00	Não	0.00	Não existe Conselho Escolar.	0.00
		B	Sim, mas não foi um problema grave	0.50	Sim, mas não foi um problema grave	0.50	Sim, pouco.	0.50
		C	Sim, e foi um problema grave	1.00	Sim, e foi um problema grave	1.00	Sim, moderadamente.	1.00
		D	-	-	-	-	Sim, muito.	1.00
2007-2011: Ocorreu na escola carência de pessoal de apoio pedagógico (coordenador, supervisor, orientador educacional)? 2013-2017: O funcionamento da escola foi dificultado por algum dos seguintes problemas? Carência de pessoal de apoio pedagógico (supervisor, coordenador, orientador educacional).	***Principal:*** TX_RESP_Q47 (2007) TX_RESP_Q49 (2009) TX_RESP_Q58 (2011) TX_RESP_Q70 (2013-2017)	A	Não	0.00	Não	0.00	Não existe Conselho Escolar.	0.00
		B	Sim, mas não foi um problema grave	0.50	Sim, mas não foi um problema grave	0.50	Sim, pouco.	0.50
		C	Sim, e foi um problema grave	1.00	Sim, e foi um problema grave	1.00	Sim, moderadamente.	1.00
		D	-	-	-	-	Sim, muito.	1.00
2007-2011: Ocorreu na escola rotatividade do corpo docente? 2013-2017: O funcionamento da escola foi dificultado por algum dos seguintes problemas? Alta rotatividade do corpo docente.	***Principal:*** TX_RESP_Q52 (2007) TX_RESP_Q54 (2009) TX_RESP_Q63 (2011) TX_RESP_Q75 (2013-2017)	A	Não	0.00	Não	0.00	Não existe Conselho Escolar.	0.00
		B	Sim, mas não foi um problema grave	0.50	Sim, mas não foi um problema grave	0.50	Sim, pouco.	0.50
		C	Sim, e foi um problema grave	1.00	Sim, e foi um problema grave	1.00	Sim, moderadamente.	1.00
		D	-	-	-	-	Sim, muito.	1.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
Teacher Shortage								
2007-2009: Algumas afirmações são usadas para explicar as dificuldades de aprendizagem dos alunos. Assinale sua posição, considerando a situação dos alunos das séries avaliadas: Relacionam-se à sobrecarga de trabalho do(as) professores(as), dificultando o planejamento e o preparo das aulas.	***Teachers:*** TX_RESP_Q64 (2007) TX_RESP_Q68 (2009) TX_RESP_Q51 (2011) TX_RESP_Q74 (2013-2017)	A	Concordo	0.00	Concordo	0.00	Sim	0.00
2011: Assinale sua posição em relação às afirmações abaixo, que se referem aos possíveis problemas de aprendizagem dos alunos da(s) série(s) avaliada(s): relacionam-se à sobrecarga de trabalho do(as) professores(as), dificultando o planejamento e o preparo das aulas.		B	Discordo	1.00	Discordo	1.00	Não	1.00
2013-2017: Na sua percepção, os possíveis problemas de aprendizagem dos alunos das série(s) ou ano(s) avaliado(s) ocorrem, nesta escola, devido à/ao(s): Sobrecarga de trabalho dos professores, dificultando o								
Teacher Motivation								
2007-2009: Indique seu grau de concordância/discordância com cada uma delas: o(a) diretor(a) me anima e me motiva para o trabalho.	***Teacher:*** TX_RESP_Q73 (2007)		Concordo		Concordo			
2011: Indique seu grau de concordância/discordância com cada uma delas. (marque apenas uma opção em cada linha.): o(a) diretor(a) me anima e me motiva para o trabalho.	TX_RESP_Q77 (2009) TX_RESP_Q60 (2011) TX_RESP_Q64 (2013-2017)	A	totalmente	1.00	totalmente	1.00	Nunca.	0.00
2013-2017: Nesta escola e neste ano, indique seu grau de concordancia: O(A) diretor(a) me anima e me motiva para o trabalho		B	Concordo	1.00	Concordo	1.00	Algumas vezes.	0.00
		C	Neutro	0.00	Neutro	0.00	Frequentemente.	1.00
		D	Discordo	0.00	Discordo	0.00	Sempre ou quase sempre.	1.00
		E	Discordo totalmente	0.00	Discordo totalmente	0.00	-	-
200-2009: Indique seu grau de concordância/discordância com cada uma delas: Sinto-me respeitado(a) pelo(a) diretor(a).	***Teacher:*** TX_RESP_Q80 (2007)		Concordo		Concordo			
2011: Indique seu grau de concordância/discordância com cada uma delas. (marque apenas uma opção em cada linha.): sinto-me respeitado(a) pelo(a) diretor(a).	TX_RESP_Q84 (2009) TX_RESP_Q67 (2011) TX_RESP_Q66 (2013-2017)	A	totalmente	1.00	totalmente	1.00	Nunca.	0.00
2013-2017: Nesta escola e neste ano, indique a frequência com que: sinto-me respeitado(a) pelo(a) diretor(a)		B	Concordo	1.00	Concordo	1.00	Algumas vezes.	0.00
		C	Neutro	0.00	Neutro	0.00	Frequentemente.	1.00
		D	Discordo	0.00	Discordo	0.00	Sempre ou quase sempre.	1.00
		E	Discordo totalmente	0.00	Discordo totalmente	0.00	-	-
2007-2009: Indique seu grau de concordância/discordância com cada uma delas: Tenho plena confiança no(a) diretor(a) como profissional.	***Teacher:*** TX_RESP_Q74 (2007)		Concordo		Concordo			
2011: Indique seu grau de concordância/discordância com cada uma delas. (marque apenas uma opção em cada linha.): tenho plena confiança no(a) diretor(a) como profissional.	TX_RESP_Q78 (2009) TX_RESP_Q61 (2011) TX_RESP_Q67 (2013-2017)	A	totalmente	1.00	totalmente	1.00	Nunca.	0.00
2013-2017: Nesta escola e neste ano, indique a frequência com que: tenho confiança no(a) director(a) como professional		B	Concordo	1.00	Concordo	1.00	Algumas vezes.	0.00
		C	Neutro	0.00	Neutro	0.00	Frequentemente.	1.00
		D	Discordo	0.00	Discordo	0.00	Sempre ou quase sempre.	1.00
		E	Discordo totalmente	0.00	Discordo totalmente	0.00	-	-

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
Teacher Motivation								
2007-2009: Indique seu grau de concordância/discordância com cada uma delas: Participo das decisões relacionadas com o meu trabalho.	***Teacher:***		Concordo		Concordo			
2011: Indique seu grau de concordância/discordância com cada uma delas. (marque apenas uma opção em cada linha.): participo das decisões relacionadas com o meu trabalho.	TX_RESP_Q82 (2007)	A	totalmente	1.00	totalmente	1.00	Nunca.	0.00
2013-2017: Nesta escola e neste ano, indique a frequência com que: participo nas decisões relacionadas com o meu trabalho	TX_RESP_Q86 (2009)	B	Concordo	1.00	Concordo	1.00	Algumas vezes.	0.00
	TX_RESP_Q69 (2011)	C	Neutro	0.00	Neutro	0.00	Frequentemente.	1.00
	TX_RESP_Q68 (2013-2017)						Sempre ou quase	
		D	Discordo	0.00	Discordo	0.00	sempre.	1.00
			Discordo		Discordo		-	-
		E	totalmente	0.00	totalmente	0.00		
2007-2009: Indique seu grau de concordância/discordância com cada uma delas: Tenho plena confiança no(a) diretor(a) como profissional.	***Teacher:***		Concordo		Concordo			
2011: Indique seu grau de concordância/discordância com cada uma delas. (marque apenas uma opção em cada linha.): a equipe de professores leva em consideração minhas ideias.	TX_RESP_Q83 (2007)	A	totalmente	1.00	totalmente	1.00	Nunca.	0.00
2013-2017: Nesta escola e neste ano, indique a frequência com que: a equipe de professores leva em consideração as minhas idéias	TX_RESP_Q87 (2009)	B	Concordo	1.00	Concordo	1.00	Algumas vezes.	0.00
	TX_RESP_Q70 (2011)	C	Neutro	0.00	Neutro	0.00	Frequentemente.	1.00
	TX_RESP_Q69 (2013-2017)						Sempre ou quase	
		D	Discordo	0.00	Discordo	0.00	sempre.	1.00
			Discordo		Discordo		-	-
		E	totalmente	0.00	totalmente	0.00		
Teacher Effort								
2007-2011: Ocorreu na escola alto índice de faltas por parte de professores?	***Principal:***	A	Não	1.00	Não	1.00	Não	1.00
2013-2017: O funcionamento da escola foi dificultado por algum dos seguintes problemas? Alto índice de faltas por parte dos professores.	TX_RESP_Q50 (2007)		Sim, mas não					
	TX_RESP_Q52 (2009)		foi um problema		Sim, mas não foi			
	TX_RESP_Q61 (2011)	B	grave	0.50	um problema grave	0.50	Sim, pouco	0.50
	TX_RESP_Q73 (2013-2017)		Sim, e foi um		Sim, e foi um		Sim,	
		C	problema grave	0.00	problema grave	0.00	moderadamente	0.00
		D	-	-	-	-	Sim, muito	0.00
2007-2011: O professor corrige o dever de casa de língua portuguesa?	***Student:***		Sempre ou		Sempre ou quase		Sempre ou quase	
2013-2017: O(A) professor(a) corrige o dever de casa de Língua Portuguesa?	TX_RESP_Q42,Q41 (2007-2009)	A	quase sempre.	1.00	sempre.	1.00	sempre.	1.00
	TX_RESP_Q53,Q51 (2011)		De vez em				De vez em	
	TX_RESP_Q52,Q48 (2013-2017)	B	quando.	0.50	De vez em quando.	0.50	quando.	0.50
			Nunca ou quase		Nunca ou quase		Nunca ou quase	
		C	nunca.	0.00	nunca.	0.00	nunca.	0.00
			-	-	-	-	O(A) professor(a)	
		D					não passa dever de casa.	0.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
Teacher Effort								
2007-2011: O professor corrige o dever de casa de matemática? 2013-2017: O(A) professor(a) corrige o dever de casa de Matemática?	***Student:*** TX_RESP_Q45,Q43 (2007-2009) TX_RESP_Q56,Q53 (2011) TX_RESP_Q55,Q50 (2013-2017)	A	Sempre ou quase sempre.	1.00	Sempre ou quase sempre.	1.00	Sempre ou quase sempre.	1.00
		B	De vez em quando.	0.50	De vez em quando.	0.50	De vez em quando.	0.50
		C	Nunca ou quase nunca.	0.00	Nunca ou quase nunca.	0.00	Nunca ou quase nunca.	0.00
		D	-	-	-	-	O(A) professor(a) não passa dever de casa.	0.00
Household Effort								
2007-2011: Ocorreu na escola alto índice de faltas por parte de alunos? 2013-2017: O funcionamento da escola foi dificultado por algum dos seguintes problemas? Alto índice de faltas por parte dos alunos.	***Principal:*** TX_RESP_Q51 (2007) TX_RESP_Q53 (2009) TX_RESP_Q64 (2011) TX_RESP_Q74 (2013-2017)	A	Não	1.00	Não	1.00	Não	1.00
		B	Sim, mas não foi um problema grave	0.50	Sim, mas não foi um problema grave	0.50	Sim, pouco	0.50
		C	Sim, e foi um problema grave	0.00	Sim, e foi um problema grave	0.00	Sim, moderadamente	0.00
		D	-	-	-	-	Sim, muito	0.00
2007-2011: Ocorreu na escola problemas disciplinares causados por alunos? 2013-2017: O funcionamento da escola foi dificultado por algum dos seguintes problemas? Indisciplina por parte dos alunos.	***Principal:*** TX_RESP_Q53 (2007) TX_RESP_Q54 (2009) TX_RESP_Q64 (2011) TX_RESP_Q76 (2013-2017)	A	Não	1.00	Não	1.00	Não	1.00
		B	Sim, mas não foi um problema grave	0.50	Sim, mas não foi um problema grave	0.50	Sim, pouco	0.50
		C	Sim, e foi um problema grave	0.00	Sim, e foi um problema grave	0.00	Sim, moderadamente	0.00
		D	-	-	-	-	Sim, muito	0.00
2007-2009: Algumas afirmações são usadas para explicar as dificuldades de aprendizagem dos alunos. Assinale sua posição, considerando a situação dos alunos da(s) série(s) avaliada(s): Estão relacionadas à falta de assistência e acompanhamento da família nos deveres de casa e pesquisas dos alunos. 2011: Assinale sua posição em relação às afirmações abaixo, que se referem aos possíveis problemas de aprendizagem dos alunos da(s) série(s) avaliada(s): estão relacionadas à falta de assistência e acompanhamento da família nos deveres de casa e pesquisas dos alunos. 2013-2017: Na sua percepção, os possíveis problemas de aprendizagem dos alunos das série(s) ou ano(s) avaliado(s) ocorrem, nesta escola, devido à/ao(s): Falta de assistência e acompanhamento dos pais na vida escolar do aluno.	***Teacher:*** TX_RESP_Q69 (2007) TX_RESP_Q72 (2009) TX_RESP_Q55 (2011) TX_RESP_Q78 (2013-2015))	A	Concordo	0.00	Concordo	0.00	Sim	0.00
		B	Discordo	1.00	Discordo	1.00	Não	1.00

Prova Brasil			2007-2009		2011		2013-2017	
Questions	***Questionnaire:*** Var. name (year)	**Option**	**Value label**	**MGMT score**	**Value label**	**MGMT score**	**Value label**	**MGMT score**
Household Effort								
2007-2009: Algumas afirmações são usadas para explicar as dificuldades de aprendizagem dos alunos. assinale sua posição, considerando a situação dos alunos da(s) série(s) avaliada(s): Ocorrem devido ao desinteresse e falta de esforço do aluno. 2011: Assinale sua posição em relação às afirmações abaixo, que se referem aos possíveis problemas de aprendizagem dos alunos da(s) série(s) avaliada(s): ocorrem devido ao desinteresse e falta de esforço do aluno. 2013-2017: Na sua percepção, os possíveis problemas de aprendizagem dos alunos das série(s) ou ano(s) avaliado(s) ocorrem, nesta escola, devido à/ao(s): Desinteresse e falta de esforço do aluno.	***Teacher:*** TX_RESP_Q71 (2007) TX_RESP_Q75 (2009) TX_RESP_Q58 (2011) TX_RESP_Q80 (2013-2015	A	Concordo	0.00	Concordo	0.00	Sim	0.00
		B	Discordo	1.00	Discordo	1.00	Não	1.00
2007-2009: Algumas afirmações são usadas para explicar as dificuldades de aprendizagem dos alunos. Assinale sua posição, considerando a situação dos alunos da(s) série(s) avaliada(s): São decorrentes da indisciplina dos alunos em sala de aula. 2011: Assinale sua posição em relação às afirmações abaixo, que se referem aos possíveis problemas de aprendizagem dos alunos da(s) série(s) avaliada(s): são decorrentes da indisciplina dos alunos em sala de aula. 2013-2017: Na sua percepção, os possíveis problemas de aprendizagem dos alunos das série(s) ou ano(s) avaliado(s) ocorrem, nesta escola, devido à/ao(s): Indisciplina dos alunos em sala de aula..	***Teacher:*** TX_RESP_Q65 (2007) TX_RESP_Q76 (2009) TX_RESP_Q59 (2011) TX_RESP_Q81 (2013-2015	A	Concordo	0.00	Concordo	0.00	Sim	0.00
		B	Discordo	1.00	Discordo	1.00	Não	1.00
2007-2009: As perguntas de 88 a 95 apresentam alguns problemas que podem ocorrer nas escolas. Responda se cada um deles ocorreu ou não neste ano. Caso tenha ocorrido, assinale se foi ou não um problema grave, dificultando o funcionamento da escola: alto índice de faltas por parte de alunos? 2011: As perguntas de 75 a 82 apresentam alguns problemas que podem ocorrer nas escolas. Responda se cada um deles ocorreu ou não neste ano. Caso tenha ocorrido, assinale se foi ou não um problema grave, dificultando o funcionamento da escola. (marque apenas uma opção em cada linha.) Ocorreu na escola: alto índice de faltas por parte dos alunos? 2013-2017: Na sua percepção, os possíveis problemas de aprendizagem dos alunos das série(s) ou ano(s) avaliado(s) ocorrem, nesta escola, devido à/ao(s): Alto índice de faltas por parte dos alunos.	***Teacher:*** TX_RESP_Q94 (2007) TX_RESP_Q98 (2009) TX_RESP_Q81 (2011) TX_RESP_Q82 (2013-2015)	A	Não	1.00	Não	1.00	Não	1.00
		B	Sim, mas não foi um problema grave.	0.50	Sim, mas não foi um problema grave.	0.50	Sim, pouco	0.50
		C	Sim, e foi um problema grave	0.00	Sim, e foi um problema grave	0.00	Sim, moderadamente	0.00
		D	-	-	-	-	Sim, muito	0.00