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DOES MANAGEMENT MATTER IN SCHOOLS?

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We collect data on management practices in over 1,800 high schools in eight countries. We show that higher management quality is strongly associated with better educational outcomes. The UK, Sweden, Canada and the US obtain the highest management scores, followed by Germany, with a gap before Italy, Brazil and India. We also show that autonomous government schools (government funded but with substantial independence like UK academies and US charters) have higher management scores than regular government or private schools. Almost half of the difference between the management scores of autonomous and regular government schools is accounted for principal leadership and governance.

There are major disparities in the quality of education within and between countries (OECD, 2012). School managerial practices may be an important reason for such differences. Unfortunately, understanding the role of management in schools within and across countries has been held back by a lack of robust and comparable instruments to systematically measure management practices and, thus, a lack of good data.

The key purpose of this article is to develop an international management index for schools and present descriptive evidence on management quality and education outcomes across schools of different types within and across countries. We used double-blind telephone interviews with school principals to collect information on management practices for over 1,800 schools across eight countries. To construct our management index, we average across 20 basic management practice measures in four areas of management: operations, monitoring, target setting and people. Each question is evaluated against a scoring grid that ranges from one ('worst practice') to five ('best practice'). Our management index for each school represents the average of these scores.

We also constructed measures of school-level pupil outcomes for these schools (when data were available) from examination results across regions and countries, creating a matched management-pupil outcome international data set at the school level.

These data allow us to document some stylised facts. First, we show that the adoption of basic managerial practices varies significantly across and within countries. The UK, Sweden, Canada and the US obtain the highest average scores, followed by Germany, Italy and Brazil, while India has the lowest scores. About half of the variance in school management is at the country-level. This share is larger in education than we have

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found from similar surveys in other sectors such as manufacturing, where most of the variation is within countries. This finding suggests that differences in the institutional environment have particularly important effects on the way schools are managed.

Second, higher management scores are positively correlated with better pupil outcomes. More specifically, we find that a one standard deviation (SD) increase in our managerial index is associated with an increase in pupil outcomes of between 0.2 and 0.4 SDs. Although the cross-sectional nature of the data does not allow us to determine whether this correlation is causal (e.g. unobservable differences across schools might drive both pupil outcomes and management quality), the result does suggest that our management data have some useful informational content.

Third, large disparities in management also exist within countries and regions, especially across types of schools. In particular, autonomous government schools – organisations that are publicly funded but are more decentralised from government control, like charter schools in the US and academies in the UK[1] – have significantly higher management scores than regular government schools and private schools. The difference in management of autonomous government schools does not reflect observable differences in pupil composition, school and regional characteristics, nor basic demographics or principal characteristics such as tenure and gender. It does, however, seem more closely linked to two features:

(*i*) the strength of governance, i.e. having strong accountability for pupil performance to an outside body; and
(*ii*) the degree of school leadership, i.e. developing a long-term strategy for the school.

Including these governance and leadership variables more than halves the managerial gap between autonomous government schools and other schools (although the gap remains significant).

Previous efforts to survey school practices support our main findings. For example, Dobbie and Fryer (2013) and Angrist *et al.* (2013) have collected extensive measures of school practices, focusing on a smaller sample of US schools. Dobbie and Fryer (2013) report in a sample of 39 New York charter schools that management practices similar to those we measure – in particular teacher feedback, data guided instruction and high expectations – are associated with substantially higher grades. Angrist *et al.* (2013) survey a sample of 36 Massachusetts charter schools and link the impact of urban charter schools[2] to practices such as instructional time, classroom technique and school philosophy – labelled the 'No Excuses' approach. Intriguingly both papers also find little or no impact of schools inputs – class size, per-pupil expenditure or teacher training – on pupil performance, a result shared with Hanushek and Woessmann (2010) on a cross-country basis.

[1] We define autonomous government schools as schools receiving at least partial funding from the government and with at least limited autonomy to follow school-specific charters in one of three areas: establishing the curriculum content, selecting teachers and admitting pupils. In our data, these are *escolas de referência* in Brazil, separate schools in Canada, private *ersatzschulen* in Germany, private-aided schools in India, *friskolor* in Sweden, academies, foundation and voluntary-aided schools in the UK (equivalent to autonomous state schools), and charter and magnet schools in the US. See Table 1 for more details.

[2] The authors find more mixed results for the non-urban charter schools.

In our data collection efforts, we focus on a set of basic management practices, which we have shown to matter across other sectors (see the survey of this work in Bloom *et al.*, 2014). The school data are less rich and do not have the compelling experimental design of the New York and Massachusetts data, however, we have a much larger sample of schools and an international dimension. Our results extend the current literature by highlighting the variance of management quality in schools within and across countries; showing the relatively low management quality in schools compared to other sectors; and the link between management and link to pupil outcomes and autonomy levels across countries.

This article also contributes to several literatures. First, we link to work on the role of institutions for school performance, focusing in particular on their implications for management practices. Many recent contributions (e.g. from the OECD's PISA studies) have also looked at this through the lens of autonomy, centralised monitoring, school choice, teacher incentives and instructional time (Woessmann, 2005, 2010; Fuchs and Woessmann, 2007; Woessmann *et al.*, 2007; Hanushek and Woessmann, 2010; Lavy, 2010; Hanushek *et al.*, 2013). Second, there is a burgeoning number of studies on alternative types of school governance and management on pupil outcomes. These studies have focused on autonomous government schools, such as US urban charter schools.[3] Third, through the analysis of principal-specific characteristics we relate to the agenda investigating the effect of school leadership (Clark *et al.*, 2009; Horng *et al.*, 2010; Dhuey and Smith 2011; Grissom and Loeb 2011; Branch *et al.*, 2012; Béteille *et al.*, 2012; Coelli and Green 2012). Finally and more generally, we contribute to the emerging literature investigating management practices in public sector institutions (Rasul and Rogger 2013; McCormack *et al.*, 2014; Bloom *et al.*, 2015).

The remainder of this article is organised as follows: Section 1 describes the data and methodology we use to measure management practices across schools. Section 2 provides a basic description of the differences in school management across and within countries. Section 3 investigates the relationship between school management practices and pupil outcomes. Section 4 explores the factors linked to the variation in management practices across countries, examining the role of school ownership and governance within countries. Section 5 concludes.

1. Data

1.1. *Measuring Management Practices in Education*

To measure management practices in schools, we adapted a survey methodology described in Bloom and Van Reenen (2007), previously employed in the manufacturing, retail and health care sectors. The survey investigates the adoption

[3] For examples of studies looking at US urban charter schools see Hoxby and Murarka (2009), Abdulkadiroglu *et al.* (2011), Angrist *et al.* (2011, 2013), Dobbie and Fryer (2011, 2013), Fryer (2014), Curto and Fryer (2014). Other studies looking at US rural charter schools include Angrist *et al.* (2011), UK academies include Clark *et al.* (2009), Machin and Vernoit (2011) and Eyles and Machin (2014). Swedish *friskolor* include Sahlgren (2011) and Böhlmark and Lindahl (2012) and Canadian separate schools include Card *et al.* (2010).

of 20 basic management practices, where the level of adoption is evaluated against a grid from one to five.[4] A high score indicates that a school adopts structured management practices. Our main measure of management practices represents the average of the scores across all 20 questions. To ensure comparability across sectors, we retained most of the questions included in our previous studies of organisations in other sectors, with modifications to reflect the school context (the full list of questions can be found in online Appendix Table A1).[5] We interviewed the principal/head teacher in each school. We measure four broad areas of management.

1.1.1. *Operations*

Standardisation of instructional planning processes: school uses meaningful processes that allow pupils to learn over time.

Personalisation of instruction and learning: school incorporates teaching methods that ensure all pupils can master the learning objectives.

Data-driven planning and pupil transitions: school uses assessment and easily available data to verify learning outcomes at critical stages.

Adopting educational best practices: school incorporates and shares teaching best practices and pupil strategies across classrooms accordingly.

1.1.2. *Monitoring*

Continuous improvement: school implements processes towards continuous improvement and encourages lessons to be captured and documented.

Performance tracking: school performance is regularly tracked with useful metrics.

Performance review: school performance is reviewed with appropriate metrics.

Performance dialogue: school performance is discussed with appropriate content, depth and communicated to teachers.

Consequence management: mechanisms exist to follow-up on performance issues.

1.1.3. *Target setting*

Target balance: school covers a sufficiently broad set of targets at the school, department and individual levels.

Target interconnection: school establishes well-aligned targets across all levels.

Time horizon of targets: there is a rational approach to planning and setting targets.

Target stretch: school sets targets with the appropriate level of difficulty.

Clarity and comparability of targets: school sets understandable targets and openly communicates and compares school, department and individual performance.

[4] In the earlier manufacturing-focused survey wave, we carried out an extensive evaluation of this approach, including comparing telephone interviews with face-to-face visits, running management experiments on firms and resurveying 5% of the sample with different interviewers and managers at the same firm. In all cases, we found strong evidence that our telephone surveys were providing a good proxy of firm management practices – see Bloom *et al.* (2012) for details.

[5] Sixteen of these 20 basic practices are considered to be relevant and applicable across all industries previously surveyed (e.g. performance-based promotion), while the remaining four are specific to the management of schools (e.g. lesson planning).

1.1.4. *People management*[6]

Rewarding high performers: school implements a systematic approach to identifying good and bad performance, rewarding teachers proportionately.
Fixing poor performers: school deals with underperformers promptly.
Promoting high performers: school promotes employees based on job performance.
Managing talent: school nurtures and develops teaching and leadership talent.
Retaining talent: school attempts to retain employees with high performance.
Creating a distinctive employee value proposition: school has a thought-through approach to attract employees.

1.2. *Obtaining School Surveys Across Countries*

We randomly sampled schools that offered education to 15-year olds and had at least 50 pupils. These schools are large enough that the type of systematic management practices we study here are likely to matter.[7] We used a variety of procedures to remove potential sources of bias from our estimates. First, we monitored interviewers' performance in contacting schools and scheduling interviews. The interviewers ran on average two interviews a day lasting approximately an hour each and spent the remainder of their time repeatedly contacting principals to schedule interviews. Second, we presented the study as a confidential conversation about management experiences, starting with non-controversial questions such as 'What is your school's plan for the next five years?' and 'What tools and resources are provided to teachers?' Third, we never asked principals about the school's overall pupil performance during the interview. Instead, we obtained such data from other sources, which were usually from administrative information (described in online Appendix A). Fourth, we sent informational letters and copies of endorsements letters from respected institutions, such as the UK Department for Education, Harvard University's Program on Education Policy and Governance and Brazil's *Itaú* Social Foundation.[8]

In terms of interviews completed, we obtained an overall high response rate (41% on average[9]), ranging from 58%, 57% and 42% of eligible schools in Brazil, Italy and India respectively to 36%, 26%, 20% and 19% of eligible school in Sweden, Germany, the US and Canada. We obtained a substantially lower response rate in the UK – 8% of eligible schools – most likely due to the proliferation of cold-calling and increasing number of telephone surveys in schools in the UK, and principals' slow turnaround time for a response after the initial contact by interviewers (which was common throughout the North American and European countries surveyed).

The overall response rate of 41% is similar to our previous manufacturing and health care surveys. It is also roughly comparable to other management surveys in education

[6] These practices are similar to those emphasised in earlier work on management practices, by for example Ichniowski *et al.* (1997) and Black and Lynch (2001).
[7] In Brazil, Canada, Italy, Germany, US and UK, these schools are part of the upper secondary or high school education system. In India, these schools are part of the lower secondary education system while in Sweden they are still considered primary schools.
[8] Despite the common practice of paying organisations to participate in research, we did not provide managers with financial incentives to participate.
[9] Average weighted by the number of interviews in each country.

such as 64% response rate of middle and high schools in Massachusetts (Angrist *et al.*, 2013), 57% response rate of UK university departments (McCormack *et al.*, 2014) and 39% response rate of New York charter schools (Dobbie and Fryer, 2013).[10]

When interviewers were able to talk with school principals they usually agreed to take part in the survey. As such, the explicit refusal rate among eligible schools was generally low across all countries surveyed, ranging from 2% in Sweden, 6% in both the US and Canada, 9% in India, 13% in both Brazil and the UK, 15% in Italy and 16% in Germany. In terms of selection bias, we compare our sample of schools for which we secured an interview with the sample of eligible schools in each country against size, ownership and location. We obtain few significant co-efficients with marginal effects small in magnitude. We further construct sampling weights and observe that our main unweighted results hold even when using alternative sample weighting schemes. We describe our selection analysis as well as the sampling frame sources and response rates in more detail in the online Appendix C.

1.3. *Maximising Response Rates and Interview Quality*

We also followed several steps to obtain a high-quality response. First, we use a 'double-blind' interview technique. That is, at one end, we conducted the telephone survey without informing the principals that their answers would be evaluated against a scoring grid. Thus, we gathered information about actual management practices as opposed to the principal's aspirations of what should (rather than what does) happen. At the other end, our interviewers did not know in advance anything about the school's performance. Interviewers were only provided with the school's name and telephone number and had generally not heard of the schools on their lists before, thus, having no preconceptions about them.

Second, we used open-ended questions – that is, questions which avoid leading responders towards a particular answer. For example, on the first performance monitoring dimension we start by asking the open question 'What kind of main indicators do you use to track school performance?', rather than a closed-ended question like 'Do you use class-room level test scores indicators [yes/no]?'. The first open-ended question is followed by further questions like 'How frequently are these indicators measured?', 'Who gets to see this data?' and then 'If I were to walk through your school what could I tell about how you are doing against your indicators?' The combined responses to this dimension are scored against a grid which goes from 1 - defined as 'Measures tracked do not indicate directly if overall objectives are being met. Tracking is an ad hoc process (certain processes aren't tracked at all)', up to 5 – defined as 'Performance is continuously tracked and communicated, both formally and informally, to all staff using a range of visual management tools'. During their training session, the interviewers are also encouraged to ask follow-up questions whenever necessary.

[10] Other establishment survey response rate benchmarks include at the high-end the US Census response rates to the mandatory Management and Organizational Practices Survey at 80% (Bloom *et al.*, 2013), in the mid-range the 30% response rate of small firms by Arora *et al.* (2014), down to the 7% response rate for chief financial officers at medium and large firms (Ben-David *et al.*, 2013).

Third, we had rigorous interviewer training. We required all interviewers to undergo one week of initial training, including multiple group scoring sessions to ensure consistency across countries.[11] We also required them to conduct and listen to at least 25 interviews to correct any inconsistent interpretation of responses. Fourth, we 'double-scored' the majority of interviews (69%). That is, we asked the team managers, whose main role was monitoring, to listen silently and score the responses provided during each interview. After the end of the interview, the team manager discussed these scores with the primary interviewer, providing on-going training and calibration.

Finally, we also collected 'noise-controls', that is data on the interview process itself (such as the time of day and the day of the week), characteristics of the interviewee and the identity of the interviewer. We include these noise controls in the regression analysis to improve the precision of our estimates by reducing some of the measurement error.

1.4. *Choosing Countries to Survey*

The choice of countries was driven by funding availability, the availability of school sampling frames and research and policy interest. We are continuing to roll these school management surveys out across countries, for example hoping to extend this shortly to China, Colombia and Mexico through collaborations with other research institutions.

1.5. *Classifying Differences Across School Types*

In order to look at management practices across different types of schools, we classify regular government schools, autonomous government schools and private schools based on two main characteristics: their source of funding and their degree of autonomy in establishing the curriculum content, selecting teachers and admitting pupils. Regular government schools receive full funding from the government (national or local level) and follow government-wide rules and regulations with little or no autonomy in these three areas. Private schools receive solely private funding (they may be for-profit or not-for-profit) and follow school-specific charters, having full autonomy over all three areas mentioned above. Autonomous government schools receive most of their funding from the government but have more autonomy to follow school-specific charters on curriculum, teacher selection and (sometimes) limited pupil selection.[12]

[11] During these calibration exercises, the whole team listened to both created role-play interviews and actual live interviews (in English) then subsequently compared scores. Any differences in scoring were discussed to ensure a common interpretation of the scoring grid. These calibration sessions were run intensively at the beginning and then periodically throughout the project (to avoid any interviewers scoring drifting over time).

[12] Pupil selection in autonomous government schools is usually not based on academic ability (although we will analyse this) but rather on other dimensions. For example, UK academies can select up to 10% of pupils on 'aptitude' (such as sporting or musical ability).

Table 1

Classifications of Autonomous Government Schools

School type	Government funding	Curriculum autonomy	Teacher selection autonomy	Pupil admissions autonomy
Escolas de referência, Brazil	Most (1)	Limited (4)	Limited (12)	None
Separate schools, Canada	All	Limited (5)	Full	Full
Private ersatzschulen, Germany	Most (2)	Limited (6)	Limited (13)	Limited (16)
Private-aided schools, India	All	None	None	Limited (17)
Friskolor, Sweden	Most (3)	None	Full	None
Academy schools, UK	Most (3)	Limited (7)	Full	Limited (18)
Foundation schools, UK	All	Limited (8)	Limited (14)	Limited (19)
Voluntary-aided schools, UK	All	Limited (9)	Limited (15)	Limited (20)
Charter schools, US	Most (3)	Limited (10)	Full	None
Magnet schools, US	All	Limited (11)	None	Limited (21)

Notes. The Brazilian *escolas de referência* are found in Pernambuco State only. The Canadian separate schools are found in Alberta, Ontario and Saskatchewan only. The following explanations refer to when *limited autonomy* is granted to autonomous government schools in these three areas plus funding.

(*1*) The state government is responsible for staff salaries, school feeding, books and uniforms, and private funding finances infrastructure investments and scholarships for low-income pupils.
(*2*) Government funding can be anywhere from 90% to 100%, the remaining can be from private sources.
(*3*) May receive private donations.
(*4*) Must meet federal standards but innovation in the curriculum design and structure is permitted.
(*5*) Catholic concepts and values determine the orientation of the standard curriculum's content.
(*6*) Curriculum must have at least the same academic standards as government schools.
(*7*) Follow the National Curriculum but with a particular focus on one or more areas.
(*8*) May partner up with organisations to bring specific skills and expertise to the school.
(*9*) Religious education may be taught according to a specific faith.
(*10*) Must meet federal and state standards but innovation in the curriculum design and structure is permitted.
(*11*) Must cover a set of core academic subjects but may concentrate on a particular discipline or area of study.
(*12*) Teachers must have passed public examinations (*concurso público*) and applied for the position to be considered for the internal selection process.
(*13*) Teachers must have at least the same education and earn at least the same wages as teachers in regular government schools.
(*14*) Local Education Authority will appoint Head Teacher from candidates shortlisted by school.
(*15*) Local Education Authority must be involved in the selection process.
(*16*) No segregation of pupils according to the means of their parents.
(*17*) Conditional on the amount of funding received by the government.
(*18*) May choose up to 10% of pupils based on aptitude.
(*19*) Cannot operate admissions outside the LEA's coordinated admissions scheme.
(*20*) Must consult other admissions authorities as well as their Diocesan Directors of Education when there are substantial changes. The school can use faith criteria in prioritising pupils for admission.
(*21*) Most have no entrance criteria but some are highly selective.

Table 1 classifies school types across these areas. By these criteria, we defined the following types of schools as autonomous government schools: *escolas de referência* (Brazil); separate schools (Canada); private *ersatzschulen* (Germany), private-aided schools (India); *friskolor* (Sweden); academy, foundation and voluntary-aided schools (UK); and charter and magnet schools (US). There are no autonomous government schools in Italy.

Online Appendix Table B1 presents means and SDs of our variables for the overall sample and Table B2 breaks them down by country and shows differences across private, autonomous government and regular government schools in deviations from country means. In the OECD countries and Brazil autonomous government schools have higher management scores than both regular government schools and private schools. India looks different, with private schools scoring most highly. However, Table B2 also shows that autonomous government schools are systematically different on many dimensions. For example, they are smaller than regular government schools and more likely to be in urban areas. Our analysis will consider whether the higher management scores (and pupil performance) of such schools is due to such confounding influences.

1.6. *Collecting Measures of Pupil Performance*

Given the absence of publicly comparable metrics of school-level performance across countries,[13] we collected several country-specific measures of educational achievement ranging from standardised (and sometimes compulsory) examination results to non-standardised examination results.

We use the following main measures in each country:

(*i*) in the US, we construct measures of school performance using the mathematics, science and reading exam pass rate from high school exit exams (HSEEs) and end-of-course (EOCs) exams in states where performance measures were available;
(*ii*) in the UK, we employ the average uncapped GCSE score, the contextual value added measure and the proportion of pupils achieving five GCSEs (level 2) including English and mathematics;
(*iii*) in Canada, we employ the school-level rating produced by the Fraser Institute, which is based on several measures of pupil achievement, including average province exam mark, percentage of exams failed, courses taken per pupil, diploma completion rate and delayed advancement rate;
(*iv*) in Sweden, we use the GPA in the 9th grade and the percentage of pupils qualifying for upper secondary school;
(*v*) in Brazil, we use the average scores for mathematics, natural sciences and language and codes of the non-mandatory high school national examination (*Exame Nacional do Ensino Medio*, ENEM). We also use 9th grade average score of *Prova Brasil* for government schools; and
(*vi*) in India, we use the average scores for mathematics, science and first language in the X standards examinations. The details of these measures and their sources for each country and are provided in online Appendix A.

[13] The main exception to this, which is relevant to our study of schools offering education to 15-year olds, is the pupil-level data on achievement collected in the framework of the PISA project. Unfortunately due to confidentiality constraints the PISA data cannot be released with school identifiers. We were, therefore, unable to match the two datasets.

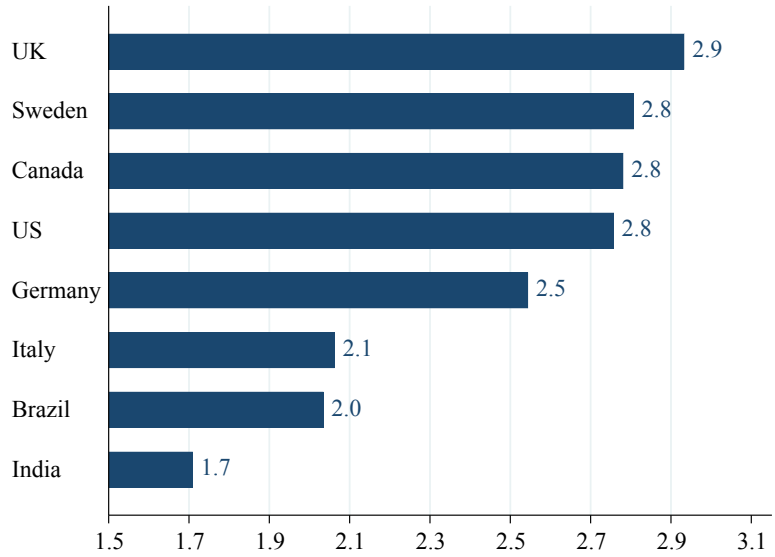

Fig. 1. *Average Management Score by Country*

Notes. Data from 1,851 schools: 513 in Brazil; 146 in Canada; 140 in Germany, 318 in India, 284 in Italy, 88 in Sweden, 92 in the UK and 270 in the US. A school-level score is the simple average across all 20 questions and the country average (shown above) is the unweighted average of these school-level scores within a country.

2. School Management Across and Within Countries

Figure 1 shows the average management scores across countries. The adoption of modern managerial processes in schools is fairly limited: on an index of 1–5, the average management score across all countries is 2.27, which corresponds to a low level of adoption of many of the managerial practices included in the questionnaire. There are, however, significant differences across countries. The UK has the highest management score (2.9), closely followed by Sweden, Canada and the US (all on 2.8). Germany is slightly lower (2.5) and Italy is substantially lower (2.1). The emerging economies of Brazil (2.0) and India (1.7) have the lowest scores. The rankings do not change substantially when we include school and principal controls suggesting that these differences in management are not driven by school, principal or interviewee characteristics.[14]

Differences in management across countries are larger in education than in other sectors. Country fixed effects account for 46% of the variance in the school management scores compared to 13% in manufacturing and 40% in hospitals across the same subset of countries and questions. This finding suggests that institutions play an important role in management practices in the education sector (Fuchs and Woessmann, 2007).

Figure 2 shows the differences across countries, splitting the management index into people management practices (hiring, firing, pay and promotions) and other non-

[14] We look in more detail at sample selection in online Appendix C, Table C4.

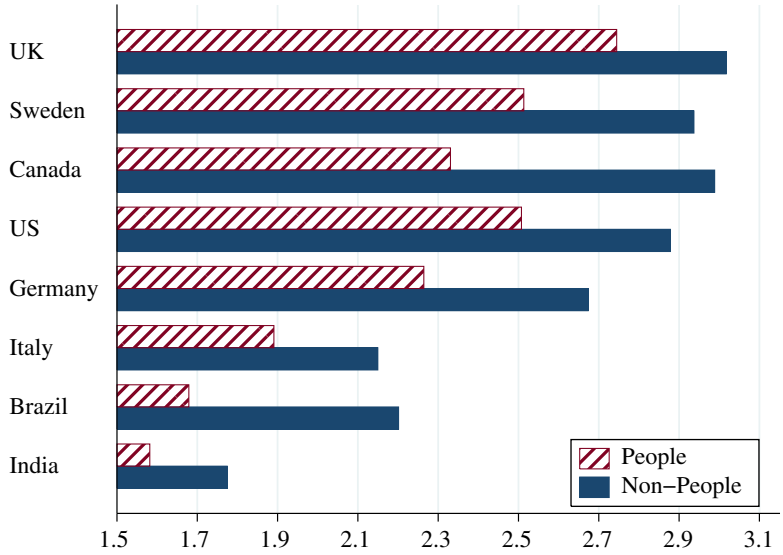

Fig. 2. *People and Non-people Management by Country*
Notes. Data from 1,851 schools: 513 in Brazil; 146 in Canada; 140 in Germany, 318 in India, 284 in Italy, 88 in Sweden, 92 in the UK and 270 in the US. Country-level averages for people management *versus* non-people management practices. Broadly speaking people management involves pay, promotions, hiring and firing, while non-people involves school operations, monitoring and targets (see the online Appendix Table A1 for the precise definitions).

people management practices (operations, monitoring and target setting). Interestingly, there are some clear variations in relative strengths and weaknesses. Across all countries, schools are notably weaker in people management practices.

Figure 3 shows the distribution of the management scores within each country with the smoothed (kernel) fit of the US for comparison. Across OECD countries, lower average country-level management scores are associated with an increasing dispersion towards the left tail of the distribution: every country except the UK has some schools scoring below two. A score of below two indicates very poor management practices – almost no monitoring, very weak targets (e.g. only an annual school-level target) and extremely weak incentives (e.g. tenure based promotion, no financial or non-financial incentives and no action taken about underperforming teachers). However, while the fraction of schools scoring between one and two is minimal in countries such as Sweden and Canada (2.2% and 2.7% respectively), it rises to 82% in India.

At the other end of the distribution, we also observe that all OECD countries have some schools scoring on average above three, which in contrast would correspond to medium to widespread adoption of the management practices (some reasonable performance monitoring, a mix of targets and performance-based promotion, rewards and steps taken to address persistent underperformance). The fraction of schools scoring above three ranges from 46% in the UK to 5% in Italy. While the distribution of management scores for Brazil is very similar to the Italian distribution (a wide dispersion of scores and a 'fat' left tail of weakly managed schools), India is

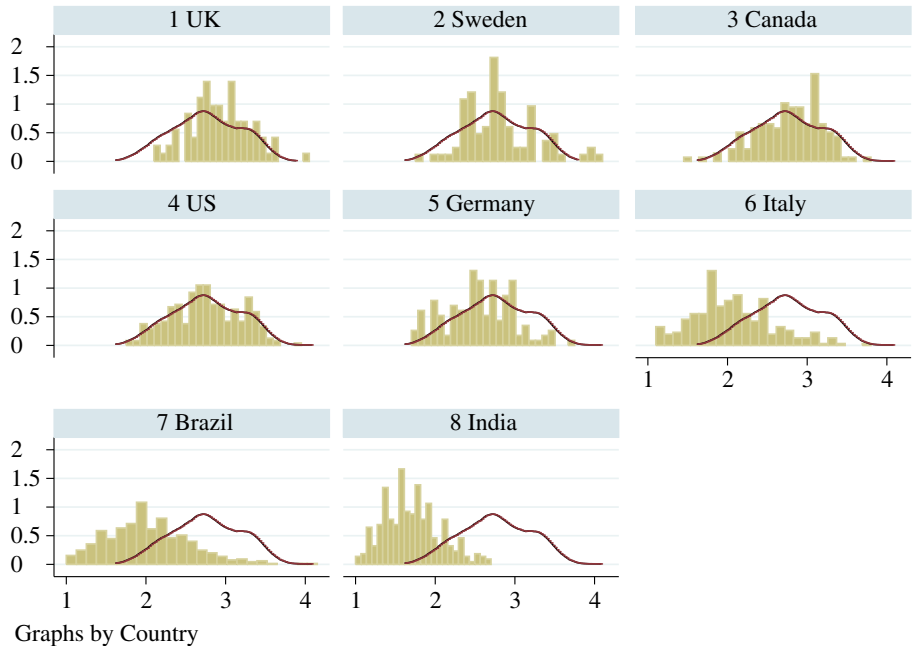

Fig. 3. *Management within Countries*

Notes. Data from 1,851 schools (513 in Brazil; 146 in Canada; 140 in Germany, 318 in India, 284 in Italy, 88 in Sweden, 92 in the UK and 270 in the US) showing the distribution of the firm-level school scores. A smoothed kernel density plot of the US data is shown on each panel for easy comparison to the US management distribution.

clearly different from the OECD countries. In India, the distribution of the management scores shifts completely to the left: the vast majority of schools scores below two and no school scores above three, indicating that Indian schools seem to have very weak management practices, with very little monitoring, target setting and use of monetary and non-monetary incentives. Looking at a comparable set of practices across other sectors, we find that the fraction of Indian firms scoring above three is 22% for manufacturing and 10% for hospitals, compared to only 1.6% for schools. This finding matches up to the long literature on poor management practices in Indian schools.[15]

Figure 4 plots the distribution of management scores for three sectors for the US and the UK. It is striking that for the US the mean of the distribution is lowest for schools, in the middle for hospitals and highest for manufacturing firms.[16] For the UK schools are in the middle of the three industries – above hospitals and below manufacturing. We can also compare our scores to those for university departments collected by McCormack *et al.* (2014) in the UK. This reports a similarly wide

[15] See, for example Duflo *et al.* (2012) and the literature discussion therein.

[16] In contrast to the average school score of 2.27 across all eight countries, the average manufacturing firm scores 3.01 for the same eight countries (firms employing 50–50,000 workers). The average school also scores lower but more similarly to the average hospital (general hospitals offering acute care plus cardiology or orthopaedics procedures), where the average score is 2.43 across these eight countries.

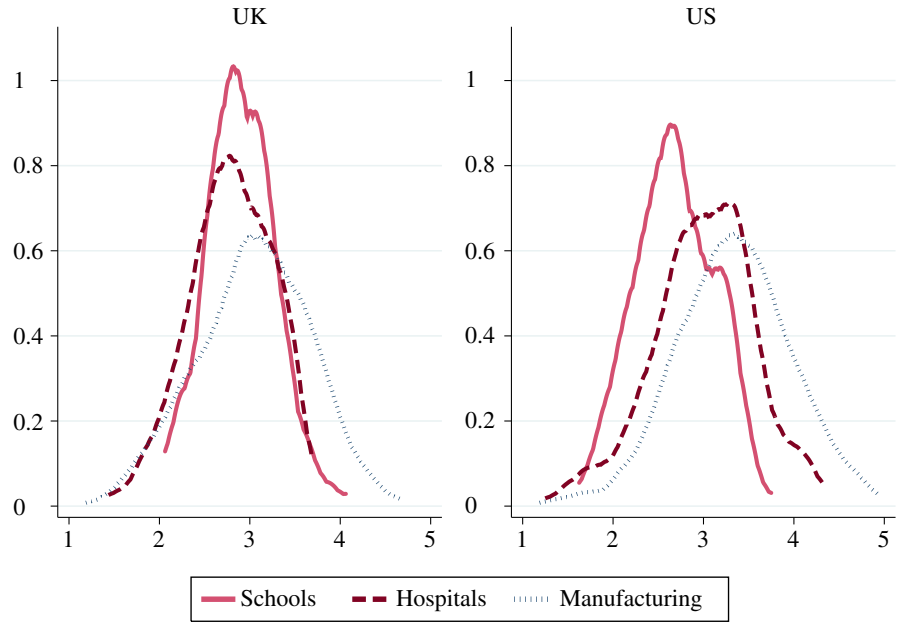

Fig. 4. *Comparing the Distribution of Management Practices in Schools, Hospitals and Manufacturing Firms in the UK and US*

Notes. The management index is constructed from the 16 questions that overlap in all three sectors. Smoothed kernel density shown for each sector. Sample sizes of 362, 511 and 2,088 in schools, hospitals and manufacturing.

dispersion of management practices in universities, with a moderately higher mean. There is also a significant positive relationship between university management practices and academics' performance in research and teaching. In the next Section, we show that the positive association between management and student performance also exists for our sample of schools.

3. Management Quality and Educational Outcomes

Are our management scores related to meaningful educational outcomes? While we not able to establish whether management is causally related to improvements in educational achievements, we see this analysis as a useful external validation exercise of our management data.[17] If the management data were just noise, there should be no systematic relationship between management and objective information on pupil performance.

[17] The association between management and firm performance has already been tested empirically in other sectors outside education, including manufacturing, hospitals and retail (Bloom *et al.*, 2012). Better management practices have also been associated with better outcomes for workers, with for example, Bloom *et al.* (2011) reporting well-managed firms have better facilities for workers such as child-care facilities, job flexibility and self-assessed employee satisfaction.

3.1. *Empirical Model of Pupil Performance*

We consider a base simple 'educational production function',[18] where school-level average pupil exam outcomes (Y_{ic}) are related to pupil composition, management and other school-level characteristics, where i denotes individual schools and c denotes country.

$$Y_{ic} = \beta^{M} M_{ic} + \beta^{AUTGOV} AUTGOV_{ic} + \beta^{PRI} PRIVATE_{ic} + \boldsymbol{\lambda}^{X} \mathbf{X}_{ic} + u_{ic}. \quad (1)$$

We are particularly interested in the co-efficient on the management index (M is the z-score of the average of the 20 individual management questions). We focus on the three types of school discussed above: autonomous government schools (*AUTGOV*), private schools (*PRIVATE*) and regular government schools as the omitted base. $\boldsymbol{X}$ is the other controls detailed below and u_{ic} is an error term. To control for some of the other dimensions that may differ across type of school we include the type of curriculum (the regular academic school programmes *versus* vocational/technical education) and whether the school can select pupils based on academic merit.

Our empirical proxies for educational outcomes are school-level measures of pupil achievement as described in Section 1 and online Appendix A. In summary, we use country-specific measures of educational achievement as follows: the percentage of pupils who passed their secondary school core subject exit exams (US), the percentage of pupils who qualified for upper secondary school (Sweden), the average overall score and subject-specific scores for secondary school exit examinations (India, Sweden and UK), rankings and contextual value added based on several indicators including pupil grades and characteristics (Canada and UK), and non-mandatory university entrance qualification national examinations (Brazil). Given the differences in school-level indicators of pupils' achievement across countries, we standardise outcome measures within each country and include country dummies in all specifications when we pool across countries.

We control for school resources and inputs by including measures of the number of pupils in the school, the pupil/teacher ratio and a dummy to capture schools that select pupils partially based on academic merits. More detailed controls for pupil characteristics depend on the data available for each country. These include the proportion of pupils who are female, non-white, who do not speak the national language as their primary language and who are eligible for free school meals (a standard poverty measure). We consider specifications that estimate (1) by pooling across all countries and using only basic controls for pupil composition, but we also show specifications where we estimate the equation separately for each country where we can control for pupil composition in finer detail (at the cost of smaller sample sizes). Finally, some specifications control for survey measurement error by including interviewer dummies, a subjective interview reliability indicator coded by the interviewer, the day of the week, time in which the interview took place and interview duration.

[18] See Hanushek (1979) for a conceptual and empirical discussion of education production functions.

We have a sample of just over 1,000 schools when we estimate (1). This smaller sample size is mainly because we do not have access to school-level performance data in Italy and Germany.[19] However, we do find a positive relationship between the average PISA pupil performance score and the average management score in German regions (correlation of 0.65, significant at the 10% level) and Italian regions (correlation of 0.63, significant at the 5% level).[20]

3.2. *Main Results on Pupil Performance*

Table 2 presents the results of regressing school-level measures of pupil achievement on the management score. The Table shows that management quality is positively correlated with pupil achievement across all countries. Column (1) reports the cross-country pooled regression with controls only for country dummies. The coefficient implies that a one SD increase in the management score index (0.65 points in the raw management score) is associated with an increase of 0.425 of a SD in pupil achievement. Column (2) includes the dummy variables for school type. Private schools and autonomous government schools obtain significantly higher pupil outcomes than regular government schools. If we drop the management variable, the coefficient on these school types rises substantially.[21] We return to the difference between school types in the next Table.

Column (3) includes the set of more general controls which slightly decreases the co-efficient on management to 0.232, and it remains significant at the 1% level.[22] The magnitude remains sizeable. For example, a 1 SD improvement in management is equivalent to 49% of the improvement associated with the selection of pupils based on academic merit. In terms of the other characteristics larger schools have higher performance as do those with a higher teacher–pupil ratio (although not significantly so).

In columns (4)–(9), we disaggregate by country and add a richer set of country-specific controls. Across all countries, management quality continues to be positively associated with better pupil outcomes and in most countries this relationship is

[19] There are also some schools in the other six countries for which we could not obtain performance data. For example, in the US we did not find public information on pupil performance in private schools and we did not collect performance data in states where we interviewed only one school or states which do not have a high school exit examination or end-of-course assessments. In India, we collected performance measures over the telephone by calling back the school and speaking to the examinations coordinators (response of 50%) but we were not able to collect information with a number of private schools no longer requiring their students to take the X Standard examinations. In Canada, the Fraser Institute 2009 school ratings were only collected in Alberta, British Columbia and Ontario. Thus, in the US, India and Canada, we were not able to collect performance data for approximately 47–53% of the sample. In Brazil, Sweden and the UK, we did not find public information for a very small portion of the schools surveyed (approximately 7–8% in each).

[20] We use 2006 PISA regional average scores for eight German regions and 2009 PISA regional average scores for 14 Italian regions, restricting to regions with five or more observations.

[21] For example, the co-efficient on autonomous government schools rises from 0.23 to 0.30.

[22] To put this result into perspective in view of the larger literature using educational production functions, *Rivkin et al.* (2005) find that a 1 SD reduction in class size (roughly three pupils per class) is associated with a 0.02 of a SD increase in achievement. Hanushek and Rivkin (2003) find that a 1 SD increase in the degree of competition (0.02 point decline in the Herfindahl Index) is associated with a reduction of 0.09 SDs in the within school variance of teacher quality. In other words, performance associations for management quality are between two and three times as large as for competition and teacher quality and over 10 times as large as for a measured input such as class size.

Table 2

Pupil Outcomes and Management

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sample of countries:	All	All	All	Brazil	Canada	India	Sweden	US	UK	UK
Dependent variable:	Cross-country pooled pupil achievement			Average maths	Fraser rating	Average maths	9th grade GPA	HSEE maths pass	Average GCSE	Contextual value added
Management (*z*-score)	0.425***	0.242***	0.232***	0.104**	0.609	0.499**	0.242	0.170**	0.512*	0.881**
	(0.046)	(0.041)	(0.044)	(0.050)	(0.368)	(0.243)	(0.206)	(0.080)	(0.272)	(0.369)
Autonomous government school		0.225*	0.396***	0.235	−0.263	0.211	0.612**	0.123	0.245	−0.309
		(0.129)	(0.114)	(0.289)	(0.467)	(0.216)	(0.291)	(0.229)	(0.319)	(0.428)
Private school		1.246***	1.139***	1.496***	0.937	0.383*			−0.633	
		(0.081)	(0.094)	(0.101)	(0.585)	(0.208)			(1.014)	
Log(pupils)			0.075*	0.126**	0.396*	0.001	0.352	0.206**	−0.620	−0.566
			(0.042)	(0.060)	(0.213)	(0.136)	(0.262)	(0.103)	(0.441)	(0.610)
Log(pupils/teachers)			−0.014	−0.118	−0.473	0.087	−0.103	−0.486	0.456	0.424
			(0.086)	(0.109)	(0.615)	(0.188)	(0.261)	(0.471)	(0.864)	(2.426)
Pupils selected on academic merit			0.477***	0.526***	0.588	0.048	2.368***	0.743**	1.145***	−0.260
			(0.109)	(0.151)	(0.488)	(0.188)	(0.496)	(0.340)	(0.400)	(0.582)
General controls	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pupil controls (country-specific)	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,002	1,002	1,002	472	77	152	82	133	86	78
Dependent variables (mean)				514.20	5.92	69.23	211.53	69.96	442.78	1002.81

Notes. Significance at the 1% level denoted by *** and ** for 5% and *10% levels. OLS estimates with robust standard errors in parentheses under coefficients. For the cross-country pooled measure, we use the maths exam pass rate from HSEEs in US (government schools only), uncapped GCSE score in UK, Fraser Institute school rating in Canada, 9th grade GPA in Sweden, average maths score in the High School National Examination (ENEM) in Brazil, average maths score in X Standards in India. In the UK, we also use a contextual value-added measure (see online Appendix A for details). Pupil achievement data *z*-scored within country. Autonomous government schools are *escolas de referência* in Brazil, separate schools in Canada, private *ersatzschulen* in Germany, private-aided schools in India, *friskolor* in Sweden, academies, foundation and voluntary-aided schools in the UK and charter and magnet schools in the US. Management is *z*-score of the averaged of the *z*-scored 20 individual questions. All regressions have country dummies. General controls**:** regional dummies, school curriculum (academic *versus* vocational) and noise (job post and tenure of interviewee; interviewer dummies, day of week; time of day and interview duration and reliability measure). Pupil controls: Brazil (% of female pupils, % of foreign and naturalised pupils and % of indigenous pupils), Canada (% of pupils whose first language is known/believed to be other than English), India (% of female pupils and % of pupils who are native speakers of the local language), Sweden (% of female pupils and % of pupils whose first language is Swedish in Sweden), UK (% of female pupils, % of pupils whose first language is not English, % of non-white pupils and % of pupils eligible for a school meal); and US (% of female pupils, % of non-white pupils and % of pupils eligible for a school meal).

significant at the 10% level or greater.[23] The correlation is largest in Canada (0.609) and smallest in Brazil (0.104).[24] It is difficult to interpret the reasons for the cross-country differences, given the different measures of test scores. Some of the differences in significance are related to sample size: the only two countries with a statistically insignificant co-efficient on management are the two with the smallest number of schools (Canada has a sample size of 77 and Sweden has 82). We do not find a systematically larger coefficient in the 'Anglo-Saxon' countries (e.g. the US co-efficient on management is smaller than the one in India), which is consistent with the view that the management measure are not inherently culturally biased.

A criticism of the results in Table 2 is that we are not fully controlling for the fact that pupil intake is very different across schools, so it may be that the better managed schools are simply lucky enough to have better quality students sorting into these schools. For one country (the UK) there are published school-level measures of value added, which tracks the average improvement in pupils' grades between entering and exiting the school. Such value-added measures are superior to just using test score measures as their control for initial intake quality. Column (10) uses value added as an outcome and shows that our management score actually displays a statistically and economically stronger correlation with this value-added measure than the raw test score measure in the previous column (0.881 *versus* 0.512). Hence, although we do not have value-added measures for all countries, it seems unlikely that differential student intake is driving the results in Table 2.

3.3. *Robustness of pupil performance results*

Online Appendix Table B4 presents some robustness tests of the results of regressing school-level measures of pupil achievement on the management using column (3) of Table 2 as a baseline. The management survey includes several questions related to people management (e.g. use of incentives, practices related to promotion and dismissals of teachers) that are heavily regulated across most of the countries in our sample. One possible concern is that regulatory constraints might reduce the observed variation along these areas of management, thus inhibiting our ability to estimate their association with school-level pupil outcomes. We look at this issue in two ways. First, the distribution of people management by country shows substantial within-country variation (online Appendix Figure B1). This finding suggests that national regulations are not homogenous or completely binding on schools. Second, people management alone is positively and significantly correlated with school-level outcomes, with a co-efficient (standard error) of 0.257 (0.046) in an equivalent specification to column (5) of Table B4. The other non-people-related areas of management are also significantly correlated with outcomes – coefficients (standard

[23] In a companion paper, Di Liberto *et al.* (2013) find a positive and weakly significant association between nationally tested student-level mathematics examinations outcomes in Italy and our management measures.

[24] In Table B3, we report the results of the association between pupil outcomes and management using alternative measures of pupil outcomes. The majority of the results are consistent with Table 2, that is management is positively and significantly associated with most available school-level measures of pupil outcomes.

error) of 0.093 (0.036) for operations, 0.133 (0.036) for performance monitoring and 0.158 (0.038) for target setting. The subset of 16 questions asked in an almost identical fashion to other sectors such as manufacturing and health care (e.g. performance tracking, goal setting etc.) has a co-efficient (standard error) of 0.248 (0.045). We also looked at a subset of questions that are related to five practices examined in Dobbie and Fryer (2013) in New York charter schools – frequent teacher feedback, the use of data to guide instruction, high dosage tutoring, increased instructional time and a culture of high expectations.[25] We constructed a similar 'Dobbie and Fryer' management index from our questions (data-driven planning and pupil transitions, adopting education best practices, personalisation of instruction and learning and clearly defined accountability for principals). The co-efficient (standard error) on this index is 0.134 (0.038).

4. How Management Varies Across Schools: The Role of Autonomous Government Schools

4.1. *Empirical Model of Management*

Having established the presence of a positive correlation between our management practices score and school-level educational outcomes, we now turn to study how management varies within countries. We distinguish between three main types of schools: private schools, autonomous government schools and regular government schools. Recall that we define autonomous government schools as schools receiving at least partial funding from the government and with at least limited autonomy in one of three areas: establishing the curriculum content; selecting teachers; and admitting pupils.[26] We use a simple regression model of the form:

$$M_{ic} = \alpha^{AUTGOV} AUTGOV_{ic} + \alpha^{PRIVATE} PRIVATE_{ic} + \boldsymbol{\alpha}^{Z} \boldsymbol{X}_{ic} + v_{ic}. \quad (2)$$

Given the differences between OECD and non-OECD countries, we estimate separate equations for Brazil and India. Although we pool across OECD countries in the main specifications, we also consider disaggregating the OECD regressions by country (online Appendix Table B5). Figure 5 shows management index differences across autonomous government, regular government and private schools in deviations from sample country means of 1. On average across countries, private schools have the highest scores, followed by autonomous government schools and regular government schools at the bottom. There is much heterogeneity in the ranking across countries, however.

[25] Dobbie and Fryer (2013) show that this set of five practices are also strongly correlated with pupil achievement and explain approximately 45% of the variation in school effectiveness. In an experimental setting, Fryer (2014) shows that the average impact of implementing these policies significantly increases pupil mathematics achievement in treated elementary and secondary schools by 0.15–0.18 SDs.

[26] Table 1 provides more details about schools under this classification across countries.

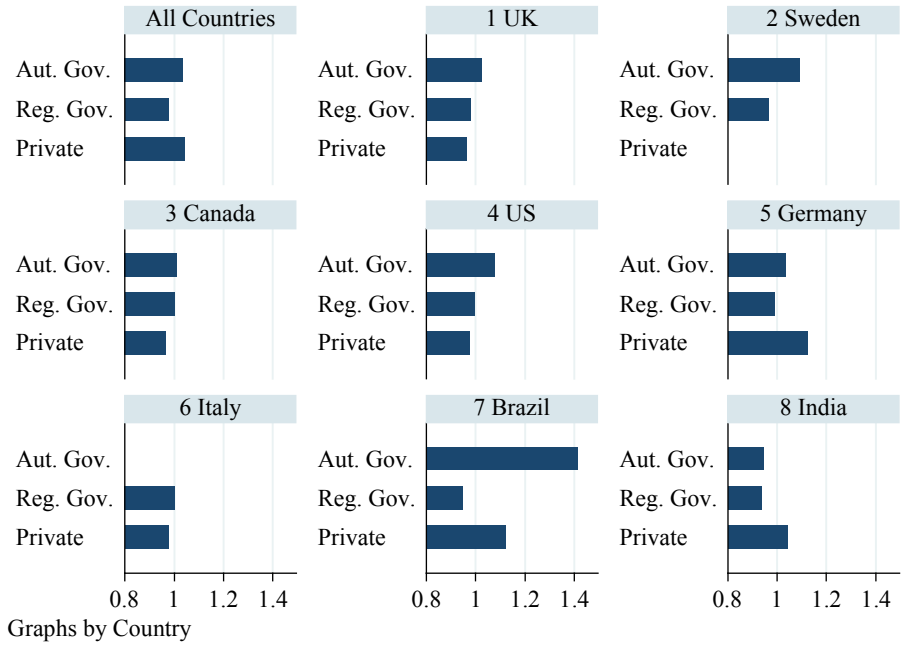

Fig. 5. *Management Index Differences across School Types – Deviations from Sample Country Means of 1*
Notes. Data from 1,567 schools. 513 in Brazil; 146 in Canada; 140 in Germany, 318 in India, 88 in Sweden, 92 in the UK and 270 in the US. 'Aut. Gov.' are autonomous government schools, 'Reg. Gov.' are regular government schools and 'Private' are private schools. There are no autonomous government schools in Italy.

4.2. *Main Results on Management*

Across OECD countries column (1) of Table 3 shows that autonomous government schools obtain significantly higher management scores than regular government schools (the omitted base category). The difference is large and significant: the management score of autonomous schools is 0.233 of an SD higher relative to regular government schools, which amounts to about 13% of the gap in management between the UK and India. Interestingly, the co-efficient on private schools is negative, suggesting that their higher pupil outcomes in earlier Tables may be due to the type of pupils attending them. The base of the Table has a test of the difference between autonomous government schools and private schools and finds this is significant across all specifications.

Clearly, differences in management may simply capture differences in observable characteristics across school types (Table B2 shows that school types differ across other dimensions beyond management). So, in column (2) we augment the specification with the other covariates used in Table 2 together with 'survey noise' controls, such as interviewer dummies. The co-efficient on autonomous government schools slightly increases, suggesting that the managerial advantage of these schools is not due to these factors. Similar to other sectors, size is significantly positively correlated with management scores. This might reflect the existence of economies of scale in management. It might also reflect the ability of better managed schools to attract more

Table 3

Management Regressions – Accounting for Differences Between School Types

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable					Management				
Country sample	OECD	OECD	OECD	Brazil	Brazil	Brazil	India	India	India
Autonomous government school	0.233***	0.273***	0.244***	1.790***	0.926***	0.893***	−0.013	0.006	0.002
	(0.086)	(0.076)	(0.075)	(0.088)	(0.179)	(0.181)	(0.150)	(0.107)	(0.110)
Private school	−0.149*	0.033	−0.004	0.504***	0.457***	0.471***	0.273***	0.015	0.008
	(0.078)	(0.071)	(0.076)	(0.089)	(0.083)	(0.082)	(0.074)	(0.067)	(0.069)
Log(pupils)		0.141***	0.113***		0.103*	0.125**		0.226***	0.221***
		(0.032)	(0.033)		(0.055)	(0.058)		(0.040)	(0.041)
Log(pupils/teachers)		−0.163**	−0.150**		−0.066	−0.079		−0.291***	−0.288***
		(0.070)	(0.070)		(0.102)	(0.103)		(0.063)	(0.063)
Pupils selected on academic merits		0.038	0.034		0.345**	0.366**		0.232***	0.230***
		(0.088)	(0.087)		(0.141)	(0.144)		(0.055)	(0.056)
Regular (non-vocational) curriculum		0.170**	0.165**		0.114	0.133			
		(0.073)	(0.074)		(0.152)	(0.152)			
Log(population density)			0.057***			−0.059			0.012
			(0.018)			(0.041)			(0.024)
Noise controls	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Test private = autonomous government (p-value)	0.000	0.014	0.012	0.000	0.020	0.040	0.070	0.937	0.959
Observations	1,020	1,020	1,020	513	513	318	318	318	318

Notes. Significance at the 1% level denoted by *** and ** for 5% and * 10% level. OLS estimates with robust standard errors in parentheses under co-efficients. All columns have country and regional controls. The management variable takes the average of all 20 management questions. Autonomous government schools are separate schools in Canada, private *ersatzschulen* in Germany, *friskolor* in Sweden, academies, foundation and voluntary-aided schools in the UK; charter and magnet schools in the US; *escolas de referência* in Brazil; private-aided schools in India. Population density is at the NUTS 3 level. Noise controls include 23 interviewer dummies, day of week; time of day interview conducted, interview duration, reliability measure and job post of interviewee.

pupils, although this is less likely given that schools tend to have difficulty growing in most systems.[27] Management is also significantly negatively correlated with the pupil/teacher ratio which may capture the fact that schools with higher resources may be able to establish and enforce better management processes (e.g. when teachers are not as overstretched it might be easier to use merit-based promotions, deal with underperformance etc.).[28]

Another possible explanation for the higher management score of autonomous government schools could be differences in location. For example, Angrist *et al.* (2013) point out that while charter schools in urban areas have positive effects on pupil achievement, non-urban charter schools are on average no more effective than regular government schools and in some instances even detrimental to pupils. To account for locational differences, we control for regional population density in column (3).[29] We do find that schools in urban areas tend to have significantly higher managerial scores but this only reduces the coefficient on autonomous government schools slightly (from 0.273 to 0.244).[30]

Online Appendix Table B5 explores the heterogeneity of the results across countries by estimating the same regression in column (3) of Table 3 separately for each of the OECD countries in our sample. The co-efficient on autonomous government schools is positive across all the countries in our sample, although it is especially large for Sweden which had the most radical institutional change towards autonomous government schools among our sampled countries.[31]

In columns (4) to (6) of Table 3, we repeat the specifications for Brazil. We also find a positive managerial differential between autonomous government schools and regular government schools, although this result is based on only three autonomous government schools, thus is difficult to generalise.[32] In contrast with OECD countries,

[27] Since private (and to a lesser extent autonomous government) schools have more ability to grow, we examined the reallocation story by looking at whether the association between management and size was stronger for these schools. We did not find systematic evidence of this, suggesting that the correlation may be more due to scale economies.

[28] Indeed, the negative correlation between management and the pupil/teacher ratio is much larger for the people management portion of the survey relative to the other non-people management questions.

[29] Our measure of population density is at the NUTS 3 level for the OECD, at the municipality level for Brazil and at the sub-district level (*Tehsils* or *Mandals*) for India.

[30] The density variable is insignificant when included in the performance regressions of column (3) of Table 2.

[31] The co-efficient on the autonomous government schools dummy is very strong and significant in Sweden, and positive but not significant in Canada, Germany, UK and US. The co-efficient on the dummy is still positive and significant at the 10% level when we pool all countries except Sweden. The Swedish case presents unique features as its education system benefited from a series of aggressive and rapid reforms in the early 1990s, starting with a decentralisation of education to the municipal level, holding municipalities financially accountable for its schools and implementing a voucher programme which led to a sharp increase in the number of *friskolor* and the number of pupils attending those schools (Sahlgren, 2011). The US charter schools and the UK academies, on the other hand, were being progressively introduced at a much slower pace, starting in the mid to late 1990s. Studying the impact of the introduction of academies on pupil achievement, Machin and Vernoit (2011) find stronger positive results for schools that have been academies for longer and who have experienced the largest changes in governance practices, suggesting that the benefits of introducing autonomous government schools in an education system may take a while to materialise.

[32] In 2007, the state of Pernambuco partnered with a group of companies committed to improving education to convert 10 existing secondary schools into a new model of reference schools. By 2010, the programme had expanded to 60 full-day and 100 half-day secondary schools (Bruns *et al.*, 2012). By 2013, it reached a total of 260 schools.

however, private schools in Brazil appear to have much higher scores relative to regular government schools. The private-regular government schools gap is substantial (about half of an SD), and is robust to the inclusion of measures of school size, curriculum offered and the ability to select pupils based on merit. Also in contrast with OECD countries, the ability to select pupils on the basis of academic merit is positively correlated with management, while the proxy for regional density is not.

The final three columns of Table 3 repeat the specifications for India. The results differ substantially from the rest of the Table. Column (7) shows that private schools score higher on average in terms of management relative to regular government schools, while no significant difference can be found for autonomous government schools. However, the private-regular government differential is insignificant when we introduce basic controls for school size, pupil/teacher ratios and the ability to select pupils. (Many of the elite Indian government schools use such selection devices; see Rao (2014) for example.) This result suggests the better performance of private schools is likely to be due to greater resources, which are particularly large in India, and casts doubt on the idea that they may be a possible solution to the chronic inefficiencies experienced in the public sector (OECD, 2012).

In summary, autonomous government schools seem to have significantly better managerial scores than regular government schools in all countries except India. Private schools, by contrast, are no better than government schools in any country except Brazil, implying that their advantages in pupil performance in Table 2 are likely to be due to selection of pupils from wealthier families.[33]

4.3. *What Explains the Advantage of Autonomous Government Schools?*

Our results indicate that autonomous government schools are fundamentally different in terms of the processes that they employ in the day-by-day management of these organisations. In Table 4, we explore what could account for the advantage of autonomous government schools focusing on OECD schools because of the differences we observed between OECD countries and emerging economies. Column (1) reports the baseline specification of column (3) of Table 3. Column (2) includes a measure of competition to see if some schools are in areas where there is more pupil choice.[34] The measure has a positive but insignificant co-efficient.[35] Column (3) adds in some

[33] To account for potential differences between faith-based and non-faith-based schools, we introduce a dummy for faith-based schools in our sample to the full specifications in columns 3, 6 and 9. In each region, the autonomous government school and the private school co-efficients remain significant and nearly unchanged. In the OECD the autonomous government co-efficient (standard error) changes to 0.235(0.075) and the private co-efficient (standard error) changes to −0.019(0.094), in Brazil the autonomous government co-efficient (standard error) changes to 0.894(0.182) and the private co-efficient (standard error) changes to 0.465(0.096) and in India, the autonomous government and the private coefficient remain unchanged. In our sample, 14.2% of interviews in the OECD, 7.8% of interviews in Brazil and 15.7% of interviews in India were run with principals of faith-based schools.

[34] Our measure of competition is collected during the survey itself by asking the principal 'How many other schools offering education to 15-year olds are within a 30-minute drive from your school?'

[35] The evidence on the impact of competition and school choice is mixed. Some studies find a positive effect (Hoxby, 2000; Ahlin, 2003; Hanushek and Rivkin, 2003; Gibbons *et al.*, 2008; Card *et al.*, 2010), while other studies find a negative effect or no effect on pupil achievement (Rothstein, 2005; Hsieh and Urquiola, 2006).

Table 4

Accounting for the Advantage of Government Schools in the OECD

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	Management						Non-people	People
Autonomous government school	0.244***	0.244***	0.233***	0.223***	0.211***	0.129**	0.050	0.296***
	(0.075)	(0.075)	(0.074)	(0.076)	(0.075)	(0.060)	(0.061)	(0.083)
Private school	−0.004	−0.006	0.013	−0.061	−0.058	−0.049	−0.193***	0.337***
	(0.076)	(0.077)	(0.076)	(0.082)	(0.083)	(0.070)	(0.074)	(0.092)
Log(pupils)	0.113***	0.112***	0.115***	0.118***	0.120***	0.070**	0.043	0.123***
	(0.033)	(0.033)	(0.033)	(0.033)	(0.034)	(0.029)	(0.030)	(0.037)
Log(pupils/teachers)	−0.150**	−0.151**	−0.151**	−0.158**	−0.163**	−0.108*	−0.035	−0.252***
	(0.070)	(0.070)	(0.071)	(0.070)	(0.072)	(0.063)	(0.063)	(0.080)
Competition		0.007			0.021	−0.006	−0.013	0.015
		(0.039)			(0.038)	(0.034)	(0.036)	(0.040)
Principal tenure (years)			−0.004		−0.004	−0.004	−0.003	−0.004
			(0.003)		(0.003)	(0.003)	(0.003)	(0.004)
Principal gender (male)			−0.134***		−0.142***	−0.097***	−0.108***	−0.066
			(0.041)		(0.041)	(0.036)	(0.038)	(0.044)
Principal has STEM background			0.070		0.072	0.059	0.077*	0.012
			(0.046)		(0.046)	(0.041)	(0.042)	(0.049)
Principal personnel autonomy				0.059	0.065*	0.060*	0.026	0.131***
				(0.037)	(0.037)	(0.032)	(0.032)	(0.038)

Table 4
(*Continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable				Management			Non-people	People
Principal budgetary autonomy				0.003	0.005	0.007	0.003	0.015
				(0.029)	(0.029)	(0.025)	(0.026)	(0.030)
Principal academic content autonomy				−0.004	−0.004	−0.015	−0.019	0.002
				(0.031)	(0.031)	(0.028)	(0.028)	(0.032)
Principal accountability						0.235***	0.234***	0.184***
						(0.022)	(0.023)	(0.029)
Principal strategy						0.236***	0.251***	0.161***
						(0.023)	(0.024)	(0.026)
Test private = autonomous government (p-value)	0.012	0.012	0.023	0.005	0.008	0.046	0.006	0.679

Notes. All columns have 1,020 observations. Significance at the 1% level denoted by *** and ** for 5% and * 10% level. OLS estimates with robust standard errors in parentheses under co-efficients. All columns contain country dummies, regional dummies, population density, whether regular academic curriculum, whether pupils selected on academic merit and noise controls. The management variable takes the average of all 20 management questions. Autonomous government schools are separate schools in Canada, private *ersatzschulen* in Germany, *friskolor* in Sweden, academies, foundation and voluntary-aided schools in the UK and charter and magnet schools in the US. Population density is at the NUTS 3 level. The competition variable is collected during the survey itself by asking the principal 'How many other schools offering education to 15-year olds are within a 30-minute drive from your school?' STEM background refers to principals with a background in science, technology, engineering, mathematics and business. The autonomy questions were asked and measured during the survey. For personnel autonomy, we ask 'To hire a full-time teacher what agreement would you need?, for budgetary autonomy, we ask 'What is the largest capital investment you can make without prior authorisation from outside?' and for academic content autonomy we ask 'To add a new class – for example, introducing a new language such as Mandarin – what agreement would you need?'. To measure the degree of autonomy, we use a 1–5 scale where 1 refers to no authority to make any decision and 5 refers to complete authority to make any decision. Principal accountability variable measures the degree to which the principal is responsible for delivering the school targets, and the principal strategy variable measures the degree to which the principal communicates a well-established strategy for the school for the next 5 years.

characteristics of the principal[36] collected in the survey (tenure, gender and whether the principal has a background in STEM 'science, technology, engineering, mathematics' or business). Of these only gender is significant: female principals are associated with higher management scores. But these covariates only reduce the autonomous government co-efficient slightly. Column (4) includes three measures of the autonomy of the principal in terms of hiring and firing, budgetary expense and curriculum choices. Column (5) includes both the principal characteristics and autonomy measures. The autonomy measures are generally insignificant with the exception of personnel autonomy (which is significant at the 10% level). Adding all six measures reduces the co-efficient on the autonomous government dummies to 0.211 from 0.244 in column (1). So these measures of principal characteristics and autonomy do not really account for much of the difference.

So what does matter? We focus on two measures (see online Appendix Table A2 for details): first; governance – the degree to which the principal is accountable to institutional stakeholders such as school external boards ('principal accountability'); and second, leadership – the degree to which the principal communicates a well-articulated strategy for the school over the next five years ('principal strategy'). Column (6) includes the principal accountability and the principal strategy variables, showing that these variables are highly significant and these two factors account for almost half of the gap between autonomous government and regular government schools (the co-efficient falls from 0.211 to 0.129).[37] Table B2 in the online Appendix shows that, accountability and strategy are very different between school types. When we break the management questions into its two different subcomponents – people and non-people management – we find that the dummy capturing principals with a STEM or business background is correlated with non-people practices, that is, operations, monitoring and target setting, but not with people management, while the opposite holds for personnel autonomy.

Online Appendix Table B6 shows the results for India and Brazil. Overall, these are broadly consistent with those shown for OECD countries. In both Brazil and India, competition, principal characteristics and autonomy are not significantly correlated with the management score, while the accountability and strategy variables appear to be large in magnitude, and positively and significantly correlated with higher management scores. These findings suggest that governance and leadership may play an important role for the performance of schools even in developing economies.

5. Conclusion

Understanding the factors associated with variations in school performance within and across countries is important. While many researchers have looked at differences in school inputs – such as teacher quality, class size and family/pupil characteristics – or

[36] For instance, Clark *et al.* (2009) find some evidence that experience as an assistant principal at the principal's current school is associated with higher performance among inexperienced principals. They also find a positive relationship between principal experience and school performance, particularly for mathematics test scores and pupil absences.

[37] Both are about equally important. For example, just including accountability reduces the co-efficient on autonomous government schools from 0.211 to 0.177.

variations in the institutional environment, such as pupil choice – few studies explore differences in school management. In this article, we show robust evidence that management practices vary significantly across and within countries and are strongly linked to pupil outcomes. Management quality seems to matter for schools.

A new finding is that autonomous government schools appear to have significantly higher management scores than both regular government schools and private schools. Their better performance is not linked with autonomy *per se* but with how autonomy is used. Having strong accountability of principals to an external governing body and exercising strong leadership through a coherent long-term strategy for the school appear to be two key features that account for a large fraction of the superior management performance of such schools.

From a policy point of view, our findings suggest that improving management could be an important way of raising school standards and give broad support for the fostering of greater autonomy of government schools. While autonomy alone may not deliver better results, alongside improved governance and motivated principals it should lead to better standards.

Our work suggests many lines of future inquiry. First, we have only presented conditional correlations. Thinking of ways to evaluate the causal effects of management interventions such as randomised control trials (Fryer and Holden, 2012) is a high priority. Second, we only account for at most half of the better management of autonomous government schools with accountability and leadership: what else is important? Are there key characteristics of principals and teachers, for example which we have missed out? Third, what drives improved school management? We have suggestive evidence that governance matters (as it does more widely in other sectors) but what about school networks, teacher skills, incentives, pupil choice and information? There is an exciting research agenda ahead.

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London School of Economics, Centre for Economic Performance, NBER and CEPR

Additional Supporting Information may be found in the online version of this article:

Appendix A. Data.
Appendix B. Additional Results.
Appendix C. Sampling Frame.
Data S1.

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