

Measuring and explaining management in schools: New approaches using public data

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EMC Census Day
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Our starting point: management matters

A growing consensus that good management is an essential feature of an effective education system that promotes **learning** for all. Bloom et al (2015), Dobbie and Fryer (2014), Lemos et al (2019), Romero et al (2018)

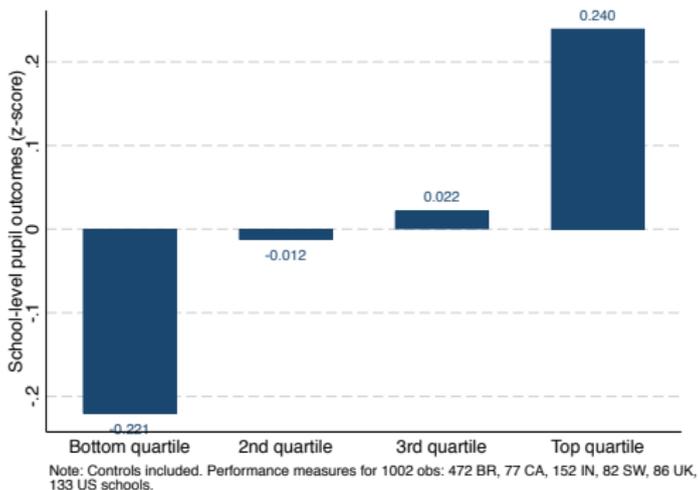


Figure: World Management Survey score against student learning outcomes

Source: Bloom, Lemos, Sadun and Van Reenen 2015, "Does management matter in education?"

This paper

We look to address two issues.

- ❶ Lack of **generalizable** information

- ❷ Lack of understanding of **mechanisms**

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- ❶ Lack of **generalizable** information
 - ▶ Specialized surveys offer great *quality* of data, but expensive to collect.
 - ▶ Large public datasets offer great *quantity* of data, but not much focus on management and organizational practices.
 - ▶ **We build a new index of management practices using large public datasets, and validate it with WMS data.**
- ❷ Lack of understanding of **mechanisms**

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① Lack of **generalizable** information

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- ▶ **We build a new index of management practices using large public datasets, and validate it with WMS data.**

② Lack of understanding of **mechanisms**

- ▶ Management matters. But **why?** Which aspects of management matter most? Via which channels?
- ▶ We developed a theoretical framework to test against the data, **with a new focus on how management shapes teachers' careers.**

Roadmap

- 1 Best measures: WMS
- 2 Measurement at scale: PISA
- 3 Mechanisms: framework
- 4 Mechanisms: empirical evidence
- 5 Conclusion

What do we mean by “management”?

Operations (broadly)

- Data-driven methods of class/school progression
- Standardization of instructional processes
- Personalization of learning
- Monitoring “key performance indicators” (non-personnel, school-wide)
- Target-setting

People management

- Selection and retention of teachers
- Re-allocation of poor performing teachers
- On-the-job training
- Incentivize teacher effort without crowing out intrinsic motivation.

Note: these categories are based on a large literature relating to productivity in the public sector (including education, healthcare and civil service).

Measurement approach

Existing data: the World Management Survey.

- ▶ Yields high quality data, but expensive and involved to set up. **Hard to do at scale.**

New data: taking inspiration from the MOPS, we follow a similar approach and apply it to **large existing** public datasets:

- ▶ PISA
- ▶ Prova Brasil
- ▶ SERCE, TERCE

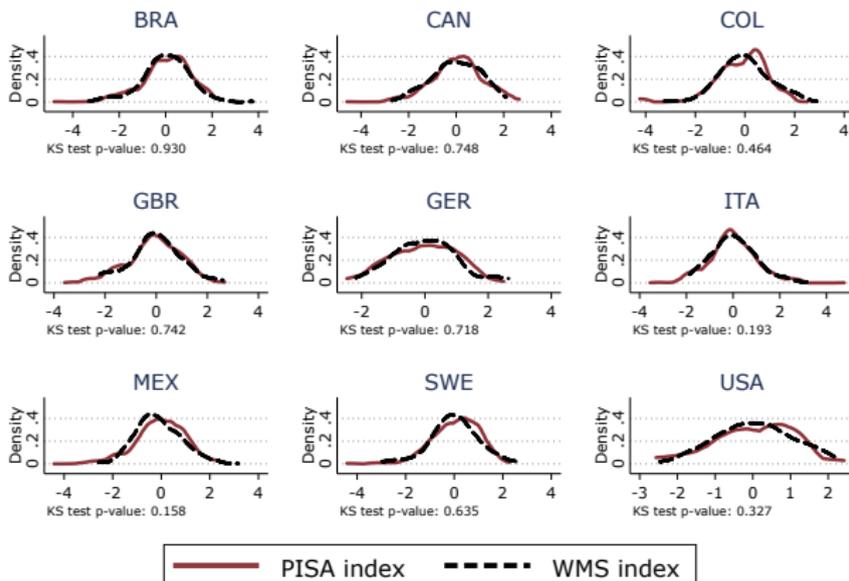
... any other large dataset that may include management-like questions.

We **categorize** the management-like questions from these questionnaires into WMS topics (for validation benchmark) and create **new management indices from these questions.**

New measurement approach: PISA data

- **Validation 1:** compare with existing good measures. We categorize 53 PISA Qs into 14 WMS topics, build equivalent indices.

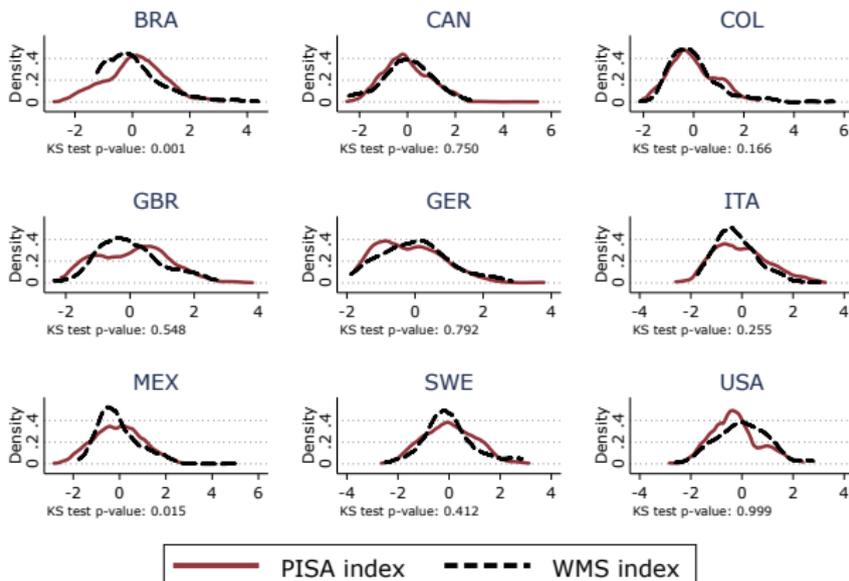
Operations management index



New measurement approach: PISA data

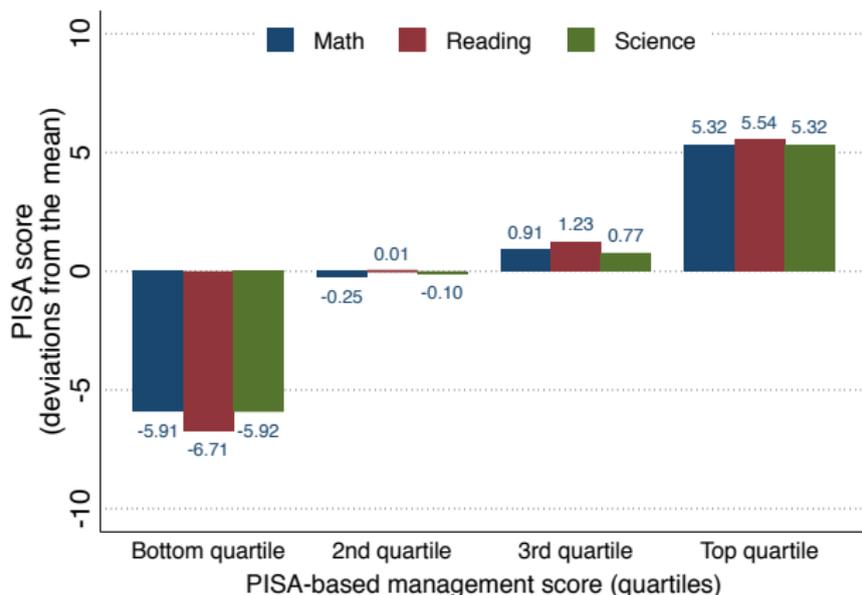
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People management index



New measurement approach: PISA data

- ▶ **Validation 1:** compare with existing good measures. We categorize 53 PISA Qs into 14 WMS topics, build equivalent indices.
- ▶ **Validation 2:** show it measures something important.



Validation: PISA scores and management

	All countries			Latin America		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: reading PISA points						
Management Index	4.904 (1.193) [0.000]	3.947 (1.172) [0.000]	3.019 (0.980) [0.002]	8.255 (1.610) [0.000]	2.681 (1.252) [0.032]	2.212 (1.008) [0.028]
Private		11.514 (2.889) [0.000]	2.911 (2.560) [0.255]	0.000	56.807 (3.301) [0.000]	31.921 (2.956) [0.000]
<i>R-squared</i>	0.243	0.290	0.423	0.032	0.173	0.342
# Observations	410701	410701	410701	78144	78144	78144
# Schools	15196	15196	15196	3075	3075	3075
# Countries	65	65	65	8	8	8
Country FE	Y	Y	Y	Y	Y	Y
School controls		Y	Y		Y	Y
Student controls			Y			Y

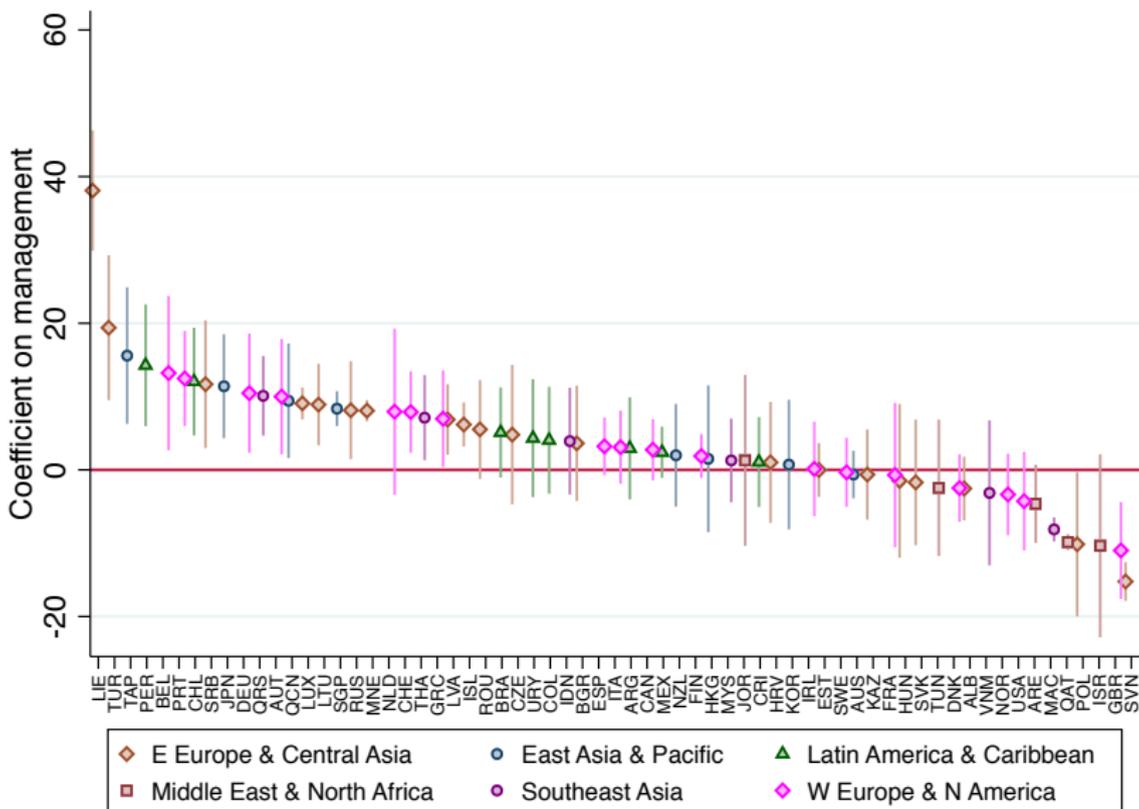
Validation: PISA scores and management

	All countries			Latin America		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B: math PISA points						
Management Index	4.689 (1.267) [0.000]	3.937 (1.272) [0.001]	2.800 (1.060) [0.008]	7.442 (1.576) [0.000]	2.432 (1.230) [0.048]	1.764 (1.039) [0.089]
Private		11.467 (2.874) [0.000]	2.001 (2.655) [0.451]		55.695 (3.713) [0.000]	32.589 (3.121) [0.000]
<i>R-squared</i>	0.307	0.342	0.450	0.041	0.185	0.350
# Observations	410701	410701	410701	78144	78144	78144
# Schools	15196	15196	15196	3075	3075	3075
# Countries	65	65	65	8	8	8
Country FE	Y	Y	Y	Y	Y	Y
School controls		Y	Y		Y	Y
Student controls			Y			Y

Validation: PISA scores and management

	All countries			Latin America		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel C: science PISA points						
Management Index	4.283 (1.187) [0.000]	3.601 (1.217) [0.003]	2.553 (0.982) [0.009]	7.859 (1.421) [0.000]	3.092 (1.144) [0.006]	2.509 (0.973) [0.009]
Private		10.215 (2.751) [0.000]	1.245 (2.377) [0.600]	0.000	55.428 (3.735) [8.161]	33.077 (3.327) [2.736]
<i>R-squared</i>	0.299	0.330	0.431	0.040	0.172	0.312
# Observations	410701	410701	410701	78144	78144	78144
# Schools	15196	15196	15196	3075	3075	3075
# Countries	65	65	65	8	8	8
Country FE	Y	Y	Y	Y	Y	Y
School controls		Y	Y		Y	Y
Student controls			Y			Y

Validation: cross-country relationship



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Why management matters: theoretical framework

Starting point: school directors are educators but also *managers*. Like a firm, schools have managerial practices/structures in place that govern the organization.

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Our contribution is to study a wider range of management practices (beyond performance pay) and to provide an **intuitive decomposition of the impact** of these practices on student learning into selection and incentive channels.

Theoretical framework: set-up → Teachers

Teachers make occupational choices between **three sectors**:

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- ▶ They receive a **job offer at a public** school and accept it, or reject it in favor of one of the other two sectors.
- ▶ **Once in the post**, they exert effort e , which generates an observable performance metric y .

Theoretical framework: set-up → Management

Management varies across **sectors**, and across **schools** within the public sector.

Focus on a system with high quality private schools and highly regulated public schools (think Western/Latin America systems)

- T1. high (good ops, good people) → only exist in the private sector
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- ▶ On the *structure* of compensation: contract on performance. ▶ evidence
- ▶ On teacher *motivation*: cultivate the intrinsic motivation of their staff.

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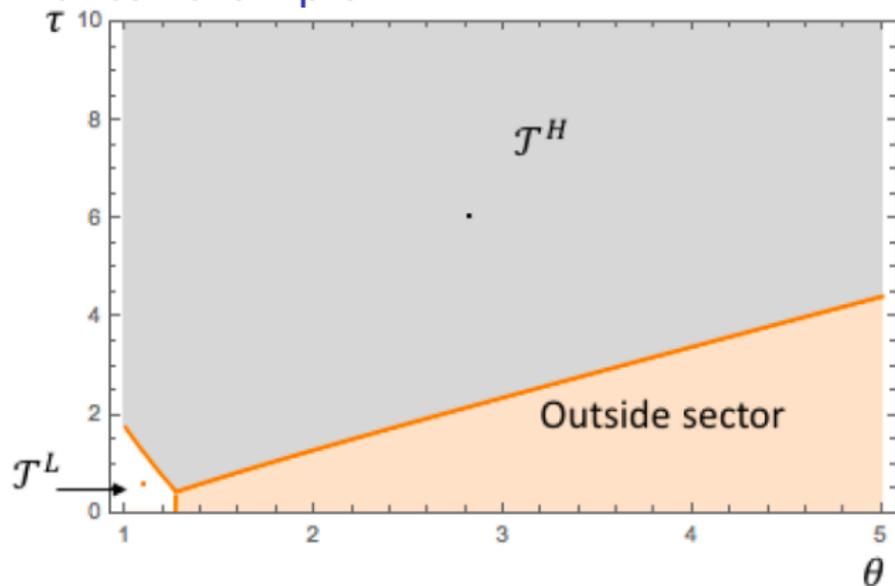
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We assume **operations management** has two effects:

- ▶ On the *level* of compensation: more enjoyable to work at the school (higher “base pay”).
- ▶ On household *effort*: create a stimulating environment for students and parents.

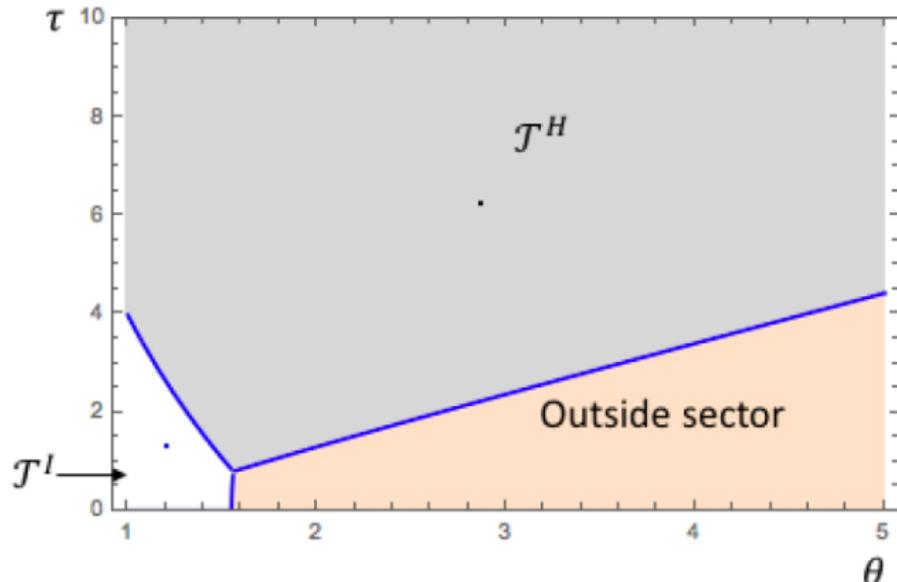
Numerical example



- $\theta=1.106, \tau=0.602$
- $\theta=2.827, \tau=6.061$

- ▶ The “L” public school experiences negative selection on θ and τ .
- ▶ More able (higher θ) teachers prefer the performance-contingent compensation schemes available in private schools or the outside sector.
- ▶ More intrinsically motivated teachers (higher τ) also prefer private schools because they anticipate exerting higher effort.

Numerical example



- $\theta=1.213, \tau=1.311$
- $\theta=2.870, \tau=6.222$

- ▶ **The “I” public school experiences less negative selection on θ and τ .**
- ▶ More able (higher θ) teachers prefer the performance-contingent compensation schemes available in private schools or the outside sector.
- ▶ More intrinsically motivated teachers (higher τ) also prefer private schools because they anticipate exerting higher effort.

Measuring intermediate channels

To consider the channels, we will **focus on Latin America** (clearest distinction of this type of school system).

We use PISA questions on these topics to build indices:

- ▶ **Teacher shortages:** whether principals experience shortages
- ▶ **Teacher motivation:** perception of teachers on student expectation, morale, enthusiasm, pride and value of academic achievement.
- ▶ **Teacher effort:** absenteeism, lateness, unpreparedness.
- ▶ **Student effort:** absenteeism, lateness, behavior, respect for teachers.
- ▶ **Parent effort:** involvement in the school (pressure, interest, volunteering, school governance)

People management and teachers: evidence

If the mechanisms we propose are correct, we should see **behavioural responses in intermediate** school outcomes.

- ▶ Lower teacher shortage in private schools
- ▶ Higher motivation and effort in private schools

People management and teachers: evidence

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	(1) z-teacher shortage	(2) z-teacher motivation	(3) z-teacher effort	(4) z-teacher shortage	(5) z-teacher motivation	(6) z-teacher effort
Private School	-0.535 (0.122) [0.000]	0.591 (0.139) [0.000]	0.792 (0.128) [0.000]			
People Index				-0.062 (0.035) [0.077]	0.238 (0.040) [0.000]	0.074 (0.033) [0.026]
<i>R-squared</i>	<i>0.152</i>	<i>0.142</i>	<i>0.154</i>	<i>0.139</i>	<i>0.169</i>	<i>0.123</i>
Observations	3035	3043	3043	3035	3043	3043
School controls	Y	Y	Y	Y	Y	Y
Country FE	Y	Y	Y	Y	Y	Y

Operations management and teachers: predictions

No teacher incentive term:

- ▶ recall: both **extrinsic** motivation and **augmentation** of **intrinsic** motivation depend on people management.
- ▶ this is assumed to be **constant** across **public** schools.

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If the mechanisms we propose are correct, we should see **behavioural responses in intermediate** school outcomes.

- ▶ Lower teacher shortages in I schools (relative to L schools)
- ▶ Higher teacher motivation in I schools schools
- ▶ Higher teacher effort and household effort in I schools schools

Operations management and teachers: results

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- ▶ Higher teacher motivation in I schools schools
- ▶ Higher teacher effort and household effort in I schools schools

	(1) z-teacher shortage	(2) z-teacher motivation	(3) z-teacher effort	(4) z-household effort
Operations Management Index	-0.080 (0.043) [0.061]	0.238 (0.041) [0.000]	0.076 (0.038) [0.044]	0.160 (0.054) [0.003]
<i>R-squared</i>	<i>0.0787</i>	<i>0.171</i>	<i>0.154</i>	<i>0.242</i>
Observations	2407	2414	2414	2414
School controls	Y	Y	Y	Y
Country FE	Y	Y	Y	Y

Summary and policy implications

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Implying fewer teacher shortages, higher teacher motivation, higher teacher effort. **Very well supported in the data.**

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We showed that:

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Implying fewer teacher shortages, higher teacher motivation, higher teacher effort. **Very well supported in the data.**
- ▶ **Operations management** may contribute via teacher selection and household incentives.
Implying fewer teacher shortages, higher teacher motivation, higher teacher effort and higher household effort. **Fairly well support in the data.**

Not causal, of course, but the model helps guide the empirical work to see which channels may be at work, pushing closer to policy implications.

Thank you!

Download the paper by scanning this QR code:



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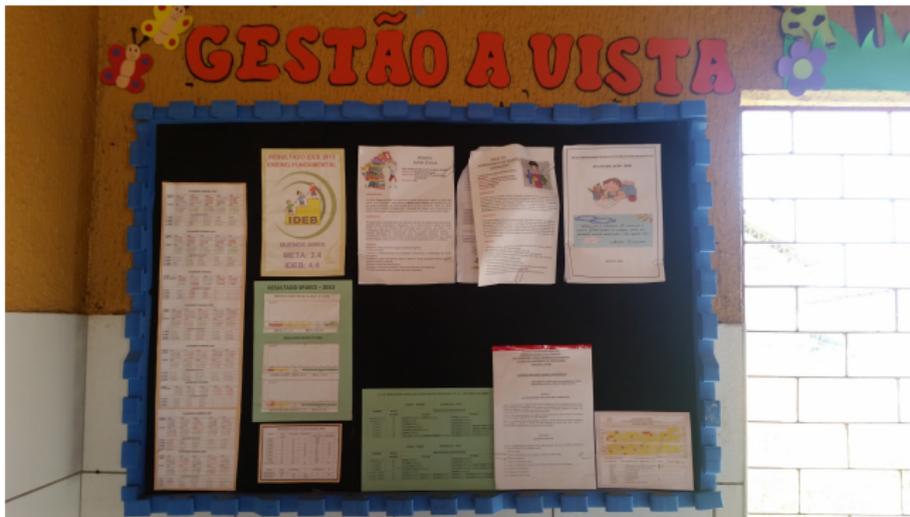
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APPENDIX

Example: Brazil



Example: India

III UNIT TEST

CLASS 5 NOVEMBER ROLL NO. 26

SERIAL NO.	SUBJECTS	MARKS OBTAINED	MARKS TEST			TOTAL	GRADE	TEACHER'S REMARKS
			1ST	2ND	3RD			
			25	25	50			
1	1st LANG (H)	25	24	49				
2	2nd LANG (T)	24	24	48				
3	3rd LANG (E)	23	23	46				
4	MATHEMATICS	16	18	34				
5	G. SCIENCE	18	24	42				
6	SOCIAL STUDIES	23	23	46				
7								
8								
TOTAL				<u>245</u>				

RANK/GRADE: (A) WORKING DAYS: (35)
DAYS PRESENT: (24)

CLASS TEACHER: *[Signature]* PARENT: *[Signature]* HEAD OF THE INSTITUTION: *[Signature]*

HALF YEARLY EXAMINATION

CLASS 5 DECEMBER/JANUARY ROLL NO. 26

SERIAL NO.	SUBJECTS	MARKS OBTAINED	GRADE	TEACHER'S REMARKS		
					MARKS TEST	
					1ST	2ND
1	1st LANG (H)	87		Try again		
2	2nd LANG (T)	52				
3	3rd LANG (E)	68				
4	MATHEMATICS	67				
5	G. SCIENCE	73				
6	SOCIAL STUDIES	54				
7						
8						
TOTAL		<u>401</u>				

RANK/GRADE: (B) DEC: (21) JAN: (21)
DAYS PRESENT: (31) (20)

CLASS TEACHER: *[Signature]* PARENT: *[Signature]* HEAD OF THE INSTITUTION: *[Signature]*

Mapping PISA into WMS categories: people

Rewarding good performers

- ▶ Use assessments to judge teacher effectiveness
- ▶ Appraisals lead to changes in salary, bonuses and public recognition
- ▶ Praise teachers whose students actively participate in lessons

Developing good performers

- ▶ Appraisals lead to opportunities for professional development, likelihood of career advancement, more responsibilities and more leadership opportunities.

Creating a good employee value proposition (attracting talent)

- ▶ Principal works to enhance the school's reputation
- ▶ Share of staff who attended professional development programs
- ▶ Share of math teachers who attended professional development programs

Note: the mapping for operations management is in the Appendix.

Measuring management using PISA

Operations

Standardization of classes

Personalization of learning

Data-driven student progressions

Adoption of educational best practices

Op (monitoring & targets)

Continuous improvement

Performance review

Performance dialogue

Balance of targets

Interconnection of targets

Stretch goals and targets

Clarity and comparability of targets

People management

Rewarding good performers

Developing good performers

Attracting talent

Mapping PISA into WMS categories: operations

Standardization of classes

- ▶ Variety of content and level of difficulty in math classes
- ▶ Principal carries out informal class observations
- ▶ Use of common textbook/curriculum

Personalization of learning

- ▶ In-class streaming
- ▶ Personalization of instruction within the classroom

Data-driven student progression

- ▶ Use assessments to inform parents of progress
- ▶ Use assessments to inform student transitions
- ▶ Systematically collect student data for decision-making

Adoption of educational best practices

- ▶ Use assessments for improving curriculum
- ▶ Promote teaching practices based on recent education research
- ▶ Invite teachers to share ideas
- ▶ Mentors teachers
- ▶ Lead/attend in-service instructional activities

Mapping PISA into WMS: operations (monitoring)

Continuous improvement

- ▶ When a teacher has problems, they are discussed
- ▶ Principal pays attention to disruptive behaviour
- ▶ Principal encourages teachers into a culture of continuous improvement
- ▶ Principal conducts informal observations
- ▶ Internal and external evaluations are used
- ▶ Student feedback is used
- ▶ There are regular consultations with experts

Performance review

- ▶ Principal evaluates the performance of the teachers
- ▶ Principal monitors math teachers with student assessments, peer review, class observation and inspector observations

Performance dialogue

- ▶ Director invites teachers to review meeting
- ▶ Director solves problems together in a group
- ▶ Director assesses strengths and weaknesses and takes action

Mapping PISA into WMS: operations (targets)

Balance of targets

- ▶ Use assessments to compare to district/national performance
- ▶ Use assessments to compare to own annual performance
- ▶ Use assessments to compare to other schools
- ▶ Check that professional development of teachers is in line with school targets

Interconnection of targets

- ▶ Principal discusses the school's academic goals at faculty meetings

Stretch goals and targets

- ▶ Use student performance to benchmark educational goals

Clarity and comparability of goals

- ▶ Achievement data posted publicly and tracked over time
- ▶ Ensure teachers work according to school goals
- ▶ Draw teacher attention to the importance of student development
- ▶ Refer to school goals when making curriculum decisions
- ▶ Written specification of school goals and student performance standards

Theoretical framework: set-up

We start from the education production function:

$$y = \underbrace{\theta}_{\text{teacher ability}} + \underbrace{e}_{\text{teacher effort}} + \underbrace{a}_{\text{student effort}} + \varepsilon \quad (1)$$

And model the impact of operations and people management practices via:

1. Teacher selection:

\uparrow management score $\Rightarrow \uparrow$ comp. package \Rightarrow select in $\uparrow \theta$ and $\uparrow \tau$ (lower c_e)

2. Teacher incentive:

\uparrow management score $\Rightarrow \uparrow$ comp. package \rightarrow extrinsically incentivize $\uparrow e$
 \rightarrow intrinsically motivate $\uparrow e$

3. Household incentive:

\uparrow management score \Rightarrow institutionalize strong work ethic ($\uparrow a$)

Set up

Assumptions:

- a. schools can be of three management types: high (good on ops+people), intermediate (good ops, weak people) or low (weak on ops+people).
- b. high management schools are found only in the private sector, while the public sector consists of a mix of intermediate and low management schools.
- c. education systems are incredibly diverse, so we focus on a type of system with high quality private schools, and highly regulated public schools (as in Latin America).

Timing

- ① A teacher observes her ability and intrinsic motivation levels, and the management practices and compensation schemes available at all employers.
- ② Assigned to a public school: accept or apply to private schools or outside sector.
- ③ Teacher chooses an effort level and, simultaneously, a representative student chooses an attention level.

The teacher's occupational choice and effort level, together with the student's attention level, determine student learning.

Set up: preferences

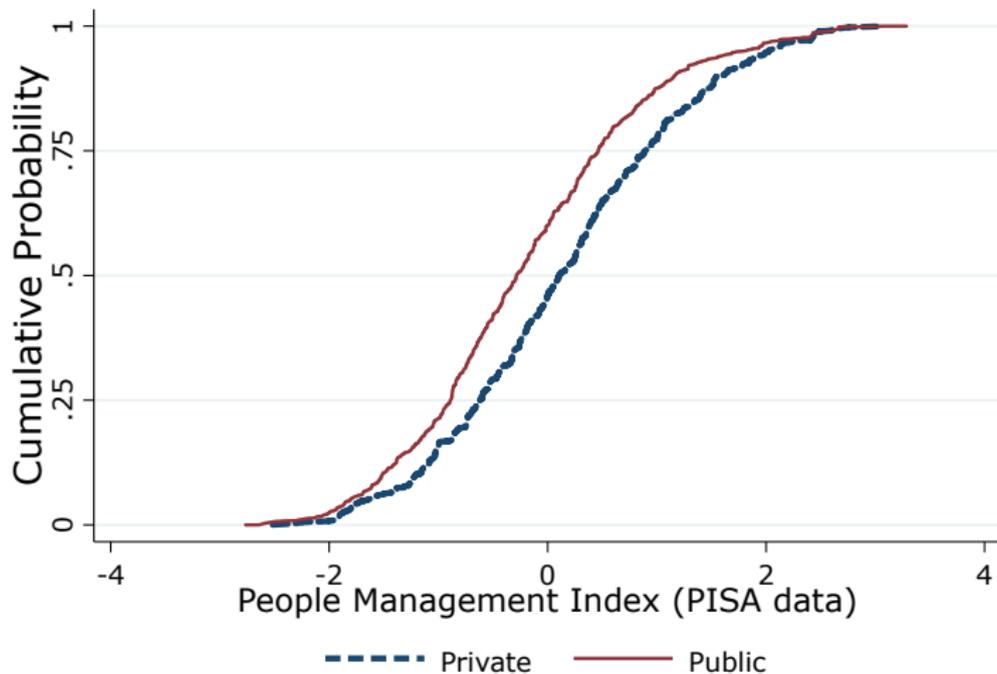
Teachers

- ▶ Teacher is risk neutral, cares about compensation w and effort e
- ▶ Preferences If they work in the education sector: $w - (e^2 - ce)$, c is intrinsic motivation
 - ▶ For $e < c/2$ she derives a marginal benefit from exerting effort
 - ▶ $c = \tau + \Delta$, τ is the baseline intrinsic motivation, and Δ is affected by people management
- ▶ Outside sector utility: $w - e^2$

Household

- ▶ We abstract from within-class differences and focus on a representative household (student and parents).
- ▶ The household cares about effort level a and has preferences $-(a^2 - \gamma a)$

People management: Latin America



▶ back

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